GEOLOGICAL SURVEY
MEMOIR 385

GOLD FIELDS OF NOVA SCOTIA

Reprinted from Memoir 156, a compilation by W. Malcolm based on the work of E.R. Faribault which was published in 1929. Funds for the 1985 reprinting of this volume were provided by the Geological Survey of Canada under the Canada — Nova Scotia Co-operative Mineral Program 1981-84.

1976

© Minister of Supply and Services Canada 1985

Available in Canada through

authorized bookstore agents
and other bookstores

or by mail from

Canadian Government Publishing Centre
Supply and Services Canada
Ottawa, Canada K1A 0S9

and from

Geological Survey of Canada
601 Booth Street
Ottawa, Canada K1A 0E8

A deposit copy of this publication is also available
for reference in public libraries across Canada

Cat. No. M46-385E Canada: $7.00
ISBN 0-660-10806-2 Other countries: $8.40

Price subject to change without notice

Ottawa, 1929
Reprinted, 1976, 1981, 1985

FOREWORD

Continued interest in the gold deposits of Nova Scotia has resulted in an on-going demand for this comprehensive compilation prepared in 1929 by W. Malcolm, a publication based on the extensive and detailed field investigations of E.R. Faribault which began during the late nineteenth century. To meet this demand the text was reprinted in 1976 and 1981 although it was not possible to reproduce the four pocket items nor the photographs that were included in the original publication. As reference copies of the original publication, Memoir 156, are available in many libraries those necessary omissions have not proven to be too serious. The present reprinting has been funded by the Geological Survey of Canada under the Canada-Nova Scotia Co-operative Mineral Program, 1981-84.

CONTENTS

PAGE
PREFACE.......... VI

CHAPTER I

INTRODUCTION.......... 1

General statement, page 1; Location and area, page 1; General history, page 2; Previous work, page 6; Summary and conclusions: Geology, page 12; Ore deposits, page 13; Future possibilities, page 14.

CHAPTER II

GENERAL CHARACTER OF THE DISTRICT.......... 15

General account, page 15; Detailed account, page 16.

CHAPTER III

GENERAL GEOLOGY.......... 20

Table of formations, page 20; Description of formations: Gold-bearing series, page 20; Lower Carboniferous, page 34; Basic intrusives, page 34; Granite, page 35; Metamorphic rocks, page 36; Pleistocene, page 38; Post-Glacial, page 38; Historical geology, page 39.

CHAPTER IV

PRIMARY GOLD DEPOSITS OF THE MAINLAND.......... 41

Introduction, page 41; General character and distribution, page 41; Mineralogy, page 42; Character of deposits and relations to country rock, page 44; Ore distribution, page 49; Genesis, page 52; Mining, milling, and metallurgy, page 55; Description of the gold districts, page 56.

CHAPTER V

SECONDARY GOLD DEPOSITS.......... 221

Placers, page 221; Modern placers, page 221; Ancient placers, page 223.

CHAPTER VI

GOLD DEPOSITS OF CAPE BRETON.......... 226

CHAPTER VII

ANTIMONY.......... 234

APPENDIX I: Statistics.......... 238

APPENDIX II: Bibliography.......... 241

INDEX.......... 249

Illustrations

Map 39A. Nova Scotia Sheet.......... In pocket
Plate I. Waverley gold district.......... Frontispiece
II. Valley of St. Mary river.......... 16
III. Lake Thomas, Waverley.......... 18
IV. Apex of anticline showing bedding and cleavage in slate, and interbedded and cross veins.......... 24
V. Quartzite showing cleavage perpendicular to the bedding.......... 28

Illustrations—*Continued*

PAGE

Plate VI. Corrugated vein showing deviation of cleavage in slate........... 28
VII. Open-cut showing belt of quartz veins........................ 44
VIII. Serpent lead on crown of anticline........................ 44
IX. Barrel quartz... 44
X. Corrugation on wall in open-cut............................ 46
XI. Hanging-wall of Serpent lead showing corrugations............ 46
XII. Belt of veins, Dufferin mine, showing entrance of angulars from the foot-wall... 48
XIII. Richardson mine, showing angulars in the foot-wall on the apex of the anticline.. 48
XIV. Borden lead, corrugated, and a bull lead on the foot-wall, not corrugated.. 48
XV. Stamp mill, Dufferin mine, Salmon river..................... 54
XVI. Ore-shoot on the Lake lode, Caribou........................ 62
XVII. Surface plant of the Guffey-Jennings Gold Mining Company, Caribou.. 64
XVIII. Surface plant of the New Egerton Gold Mining Company, Fifteen-mile stream.. 84
XIX. Modstock gold mine, Forest Hill........................... 86
XX. Isaac Harbour, looking up from Victoria lead................ 94
XXI. Surface plant, Micmac gold mine, Leipsigate................ 116
XXII. Surface plant of the New Albion gold mine, Montague.......... 126
XXIII. Taylor lead and underlying veins, worked on the apex of the anticline.. 134
XXIV. Serpent lead, Touquoy gold mine........................... 136
XXV. Serpent lead, Moose River................................ 136
XXVI. Mill of the Oldham Mining Company, Limited................. 152
XXVII. Cunard cove, The Ovens.................................. 156
XXVIII. The Ovens.. 156
XXIX. Dufferin mine, showing the vein on the apex of the anticline...... 168
XXX. Old dump on the Wellington and Dewar workings.............. 176
XXXI. New Glasgow Gold Mining Company's plant.................. 176
XXXII. Power plant, Dominion Mining Company, Tangier............. 192
XXXIII. Surface plant of the Boston Richardson Mining Company........ 196
XXXIV. Surface plant of Dolliver Mountain Gold Mining Company....... 198
XXXV. Laidlaw hill, Waverley.................................... 204
XXXVI. Lake View gold mine, Waverley............................ 206
XXXVII. Open-cut on the Plough lead, Wine Harbour................. 210
XXXVIII. Gays River gold mine.................................... 224
XXXIX. Great Bras D'Or Gold Mining Company's crusher, Middle River.. 230
XL. Shaft house and mill building, Dominion Antimony Company..... 236

Figure 1. Workings on Cape and West lodes, Central Rawdon............ 70
2. Longitudinal section of the workings on the fissure vein at the Micmac mine, Leipsigate.................................... 116
3. Longitudinal section on the principal workings of the Annand lead, Montague.. 128
4. Transverse section of West Lake mine, Mount Uniacke.......... 143
5. Transverse section in detail of a part of West Lake mine, Mount Uniacke... 144
6. Transverse section of Bluenose gold mine, Goldenville.......... 180
7. Detailed transverse section of the 280- and 364-foot levels of the Bluenose gold mine, Goldenville.......................... 181
8. Longitudinal section on Hard lead, South Uniacke.............. 186
9. Section across anticlinal fold between Copper and Rush lakes, Tangier gold district.................................... 189
10. Section across anticlinal fold on Tudor mine, Waverley gold district.. 201

Plan and sections, Goldenville Gold district.......................In pocket
Plan and section, Oldham Gold district...........................In pocket
Plan and section, Brookfield Gold district.........................In pocket

PREFACE

This memoir is a compilation, and does not represent, in any way, the result of field investigations by the author. The essential data and facts were gathered from the studies of E. R. Faribault who not only assisted in the work of compilation by imparting valuable information and by lucid explanation, but, after reading the original manuscript, tendered many useful hints and helpful suggestions.

Gold Fields of Nova Scotia

CHAPTER I

INTRODUCTION

GENERAL STATEMENT

The gold fields of Nova Scotia—the most easterly province of Canada—occupy that half of the province lying along the Atlantic coast and extending the full length of the peninsula. The rocks consist of an immense thickness of quartzites[1] and slates folded in long, east and west anticlines, and intruded by granite. The ore deposits are in veins which are aggregated on the domes of the plunging anticlines. Gold was discovered nearly seventy years ago, and since that time the district has received much attention from geologists of repute. Careful and detailed field work has been done, and many partial reports have been written; but no complete and final report has been issued. The object of the present compilation is to lay before the public a record of the results of these investigations, along with other more detailed information acquired by Mr. Faribault during his many years of labour in the field.

LOCATION AND AREA

The area occupied by the geological formations in which the gold is found[2] forms approximately an isosceles triangle with its apex at Canso and its base at the western end of the province. The southern side of this triangle is the Atlantic coast and the northern side is a line running along the south shore of Chedabucto bay and extending west to the mouth of Avon river and along the south side of the valley of Cornwallis and Annapolis rivers to St. Mary bay. The northern boundary is rendered irregular by the overlapping of sedimentary rocks of Palæozoic age. These occupy parts of the valleys of Musquodoboit, Shubenacadie, and Avon rivers, and isolated areas on South mountain.

The extreme length of the area is about 275 miles. Its width varies from 10 miles at the eastern end to 40 miles along a line from Tangier to Stewiacke and 75 miles at the western end along a line from Digby to Lockeport. It has an estimated extent of 10,250 square miles—about half that of the entire province—of which 4,000 square miles are underlain by granite and 6,250 square miles by quartzites and slates. It embraces all of Yarmouth, Shelburne, and Queens counties, nearly all of Lunenburg and Halifax, and parts of Guysborough, Colchester, Hants, Kings, Annapolis, and Digby counties.

---

[1] Locally called whin.

[2] *See* Map No. 39A.: Nova Scotia sheet.

GENERAL HISTORY

Gold mining in Nova Scotia has been carried on continuously for nearly seventy years; although many of the numerous districts have from time to time discontinued operations, during no year since 1862 has work wholly ceased throughout the province.

Although no systematic explorations leading to any marked results were made until the middle of last century, there are various reports of some earlier knowledge of the occurrence of the precious metal in Nova Scotia. Heatherington[1] was of the opinion that

> "The French names of Bras d'Or, cape d'Or, and Jeu d'Or (now corrupted into Jeddore) strongly confirm the belief that the presence of gold, in those localities especially, was not unknown to the first Acadian settlers. No ancient workings that could positively be recognised as such have been discovered."

It is reported that when roads were being constructed in the thirties of the last century, at Isaac Harbour and at Sherbrooke, the labourers noticed a bright yellow metal in the stone, but "ridiculed the idea of the 'yellow stuff' being valuable, and used to 'whittle it up' with their knives." A similar report was made with reference to Ovens district.[2] Canon Gray, who died in 1868, aged 70, stated that as a boy "he had taken gold out of rocks on his father's property near Halifax, and had it melted by a jeweller in that town." It is also reported that gold was washed from the Avon at Windsor early in the century. W. Cook, of Lawrencetown, is said to have found gold in quartz early in 1849, while repairing a dam within a few rods of where it was discovered in large quantities eleven years afterwards. Richard Smith of Maitland is stated on good authority to have had in his possession, in 1857, scales of gold from a river in Musquodoboit settlement.

The authenticity of some of these reported early discoveries, however, is doubtful. Pyrite, chalcopyrite, and mica scales have frequently been mistaken for gold, and the excitement over the gold discoveries of the province has probably led some men to imagine that glittering particles seen years previously in the streams or in the rocks were particles of the precious metal. The names Bras d'Or, cape d'Or, and Jeddore were probably suggested by some striking feature such as the beautiful yellow and red colouring of the hardwood forests, or the yellow glow cast by the sunset at the time of discovery, and probably have no connexion with the discovery of gold. The Gold-bearing series is not to be found at cape d'Or nor around Bras d'Or lakes. Avon river flows for only a very short distance over rocks of the Gold-bearing series, so there is little probability of its sand being auriferous.

None of the above discoveries, if authentic, led to the establishment of a mining industry. The first careful explorations were made by John Campbell, who, being prevented from making a trip to California, conceived the idea of searching in his native province for the precious metal. In 1849 he succeeded in panning gold from several places along the shore, and in 1857 washed it from the sands at Fort Lawrence, Halifax harbour. He had such faith in this source of the metal that he procured a licence to prospect and mine the sands of Sable island, but the Government offered such illiberal terms that the undertaking was dropped. Later investigations showed that the sands of some of the rivers of Cape Breton island are auriferous. Alluvial mining, however, never assumed very great proportions. The sands on the shore at the Ovens were washed in 1861 and 1862; the ancient conglomerates at Gays river were mined for a few years, chiefly in the seventies; much surface material was crushed early in the nineties at Moose river, lake Catcha, and a few other places; and washing has been carried on to a small extent in other places, but no important industry was ever established.

---

[1] Heatherington, A.: "Gold Fields of Nova Scotia," 1868, p. 20.
[2] How, H.: "Mineralogy of Nova Scotia", 1868, p. 37.

Probably the discovery that resulted eventually in the establishment of the gold industry in Nova Scotia was that made by Lieutenant C. L'Estrange, who, in September, 1858, while moose hunting in that part now known as Mooseland, on Tangier river, found traces of gold in quartz. In May, 1860, John G. Pulsiver, of Musquodoboit, accompanied by Joe Paul, one of L'Estrange's Indian guides, happened upon the same spot, and found much quartz carrying gold.[1] On his way to Halifax to report his discovery he noticed other districts that appeared promising to him, one of which he pointed out to Peter Mason, who made a discovery in October, 1860, at the head of Tangier harbour. Samples shown to the government officials in 1860 failed to convince them of the value of the discoveries; however, the rush of people into Mooseland and Tangier in the spring of 1861, and the numerous discoveries made, forced action, and Mooseland and Tangier were officially proclaimed gold districts and surveyed in April, 1861.

The great excitement that prevailed at Tangier with the opening of spring, 1861, spread into other parts of the province; men recognized a similarity between the rock at Tangier and that of other localities, and, though nothing was known of the geological structure, the summer of 1861 witnessed the discovery of gold in a large number of the important mining districts—Sherbrooke, Wine Harbour, Lawrencetown, Oldham, Waverley, etc. These regions, in which the auriferous quartz was found, were proclaimed by the Government as mining districts, and surveyed into areas of uniform size, which were leased to the miners.

There has been much variation in the degree of activity manifested at different periods in the history of the gold industry. The year 1861 saw a wild stampede into the mining districts and during the winter[2] "many hundreds of areas were taken up by persons who had never seen even the surface soil of the tracts they applied for," and when the melting of the snow in the spring failed to reveal an abundance of gold glittering upon the surface of the rock the would-be miners were discouraged. Very few had had any experience in mining, the majority were looking for fabulous wealth, but were soon undeceived, and many of those who were successful in discovering auriferous veins expected them to consist wholly of rich ore, and became discouraged as soon as lean ore was struck. The smallness of the areas, especially at Tangier and the Ovens, made it impossible for any person with capital to pursue a mining policy, and hampered the individual miner. The areas were generally 150 feet by 250 feet, but at Tangier they measured only 20 feet by 50 feet, the smaller dimension being along the strike of the vein. It was impossible for the miner to get rid of the water, and operations were necessarily very expensive. The result was that in the summer of 1862 there was a depression in the industry which reached its lowest ebb in the autumn.

---

[1] Heatherington, A.: "Gold Fields of Nova Scotia", p. 27.

[2] Hamilton, P. S.: Report of the Chief Gold Commissioner, for 1863, p. 3.

This was followed by a gradual change in the mining policy pursued by different operators. Individual work on small areas began to fall off, owners of adjoining areas united their forces, and operations were thus more economically carried on. There was a tendency for many small areas to pass into the hands of one operator, and mining companies acquired blocks of land for which an economical mining policy could be outlined and pursued. Although the number of lessees decreased, the number of areas worked increased. Thus almost immediately after the depression in 1862 came a gradual revival of the industry, which culminated in wild excitement in 1867 and 1868. In 1867 the production reached 27,583 ounces. It was a period of speculation; American and English speculators aimed at getting rich quickly by fair means or foul, with the result that gold mining in Nova Scotia received a blow from which it took fifteen years to recover. Production fell off, until in 1874 it amounted to only 9,141 ounces.

Inquiry was made into the causes of the decline, and the following were considered by Selwyn as most prejudicial to the progress of the industry:[1]

"(1) The rash expenditures of capital in the purchase of mining rights respecting the actual value of which nothing is known with certainty.

(2) The hasty and inconsiderate erection of costly machinery for mining and treating the ores, before their quantity or their probable value has been determined.

(3) The attempts frequently made to enhance the value of the stock by declaring dividends, sometimes paid out of capital, but often by means of a process commonly known as 'picking the eyes out of the mine,' or in other words selecting all the rich material to secure a few high yields which are far in excess of anything likely to be the future average.

(4) The too common, almost universal, practice of devoting the whole of the net proceeds to the payment of dividends, and having no reserve fund to meet expenses when poor ground has to be worked through........

(5) The small size of the 'areas' or claims, not as regards actual acreage, but in relation to the position and thickness of the veins. This necessitates a wasteful multiplication of shafts and plants of machinery for crushing and dressing the ores. . . . .

(6) The disregard of the natural features of the ground, shown in locating the crushing and dressing machinery without reference to the easy delivery of the material from the mine and the fall required for the perfect treatment of the ores, and for getting rid of the tailings. . . . .

(7) The almost universal want of any appliances for saving pyrites and fine gold."

---

[1] Geol. Surv., Canada, Rept. of Prog. 1870-71, p. 277.

In addition to these, Hind mentions some other causes such as[1]:

(1) Frequent incompetency of some of the so-called mine managers.

(2) Ignorance of managers regarding the pay-streaks.

(3) Neglect to preserve records and plans of work done, which are absolutely necessary for acquiring a knowledge of the ore-shoots.

In 1872 a great change took place in the system of mining; operating by companies was almost completely discontinued, and the system of working the mines by tribute was introduced, became very general, and was the chief system in vogue for a decade. It is briefly this: two or three practical miners take over a mine for a stated period and agree to pay the owner a percentage of the value of the gold extracted, trusting by the exercise of economy, and the elimination of pilfering of high-grade ore to make a fair profit on their venture. The introduction of this system resulted in a decrease in the number of workmen. At first, it seemed to promise fair results and a number of leads that had been abandoned by companies were re-opened, but it was not long before it was seen that it was attended with serious disadvantages.

Although the system kept the industry alive, it prevented the carrying out of any well-defined policy of development or of preparation for economic continuance of mining. The main object was to follow the pay-shoot and remove the ore as economically as possible without regard to the future welfare of the mine. Timbering was inadequate or neglected, waste rock was allowed to fill the old workings, of which no plans or records were kept, and the roofs of the mines were destroyed by the removal of the upper parts of veins where they were found to be auriferous. Under this system the extraction of the gold from the quartz was frequently very crude and resulted in much loss. There was also the loss resulting from operating on a small scale and from the lack of labour-saving machinery.

During the seventies the introduction of dynamite was attended with favourable results.

In 1883 and 1884[2] several successful attempts were made by men of experience and training to re-open mines that had been idle for ten or fifteen years, and the year 1885 saw a marked increase in the production, which amounted to 22,203 ounces. This success was due in a great measure to the practice of close economy, the application of scientific principles by men of intelligence, and the introduction of modern methods, and better machinery and mills. So economical had the operations become that large bodies of low-grade ore, yielding from 4 to 6 pennyweights per ton, were mined with profit. This period of prosperity continued for a number of years. In 1893 and 1894 there was a decided decrease in production. This was followed immediately by a marked increase, and from 1896 to 1903 the yield was over 25,000 ounces per annum, and in 1898 reached the maximum 31,113 ounces. During these latter years much attention was given to the concentration and treatment of the tailings. The chlorination process was first tried, but met with little success; the introduction of the cyanide and bromo-cyanide treatment, however, led to the recovery of much gold that had formerly been lost.

The production dropped from 25,198 ounces in 1903, to 14,279 ounces in 1904, and has since remained very low.

---

[1] Report on Sherbrooke Gold District, p. 60.

[2] Hardman, J. E.: Can. Min. Man., 1892, p. 13.

PREVIOUS WORK

Although the slates and quartzite along the Atlantic coast received some attention from the earlier geologists, and there was some speculation as to their age, it was not until after they were made important by the discovery of the auriferous quartz veins, that they were brought prominently to the notice of the geologist.

Among the earliest investigators were Jackson and Alger, Gesner and Dawson. Judge Haliburton in his "Historical and Statistical Account of Nova Scotia," 1829, described these rocks as consisting of clay slate and trap, the latter in some places apparently interstratified with the former, but generally occurring in confused masses. In "Remarks on the Mineralogy and Geology of Nova Scotia," 1833, Charles T. Jackson and Francis Alger gave a brief description of the clay slate and the quartz rocks of the Atlantic coast. They considered the quartzite, which they found to alternate frequently with the slate, as contemporaneous with it, and in no way of the nature of trap. These sedimentary rocks were regarded as later than the granite. Mention was also made of veins of quartz found on the west coast. The work was accompanied by a geological map on which the slates were marked as "Transition Clay Slate"; a few bands were laid down diagrammatically to represent "Quartz rock alternating with Clay Slate."

The next important contribution to our knowledge of the geology of Nova Scotia was that made by Abraham Gesner in "Remarks on the Geology and Mineralogy of Nova Scotia." This was published in 1836 and was accompanied by a geological map. Rather detailed descriptions were given of the granite, of the clay slate and quartzite, and of the gneiss and mica slate. The clay slate and associated quartzite were regarded as overlying the granite and of later age. The granite was classed as Primary and it was pointed out that according to the older geologists the slate and quartzite would be regarded as Transitional as they were among the most ancient of the secondary strata. Notwithstanding his conclusion that the sedimentary rocks are younger than the granites, there was a tendency on Gesner's part to regard the granite as intrusive; the altered sediments found in contact with the granite were regarded as having been subjected to intense heat and the greatly disturbed condition of the sediments, which was most noticeable in the vicinity of the granite, was related to some great upheaving force.

The boulders scattered over the surface of the province were considered to be due to great floods and to the violence of volcanic explosions.

As regards the occurrence of economic minerals Gesner remarked,[1] " it will be safe to affirm, that that portion of the province which is occupied by the slate, contains ores of the most useful and important kinds."

" Geological Map of Nova Scotia with an Accompanying Memoir " by Gesner, was presented to the Geological Society of London in 1843, but the map was not published until 1845, when it appeared in vol. I of the Geological Journal. In 1836, Gesner included the fossiliferous iron-bearing rocks of South mountain in his slate division, but on the map of 1845 he made a distinction between the fossiliferous and the non-fossiliferous. In "Industrial Resources of Nova Scotia," 1849, he classified the rocks along the Atlantic coast as granitic or hypogene rocks, and stratified, non-fossiliferous rocks of Cambrian age.

---

[1] Gesner, A.: "Geology of Nova Scotia", p. 65.

The publication of Dawson's " Acadian Geology ", in 1855, showed that the author had done some close observing in his study of the " Granitic metamorphic" district. In this work the different rocks are classed as granite, gneiss, mica-slate, clay-slate, and quartz-rock or quartzite. The granite, of various textures, sometimes porphyritic, is of deep-seated igneous origin, and the gneiss and mica-slate in contact with it are regarded as much altered sedimentary rocks. The slates and quartzite, the general strike of which is northeast and southwest, are considered as resulting from sandstones and clays; in fact, all the rocks except the granite are looked upon as metamorphosed sandstone and clays. There are intermediate forms between the different classes mentioned. Some attention is given to a discussion of the age of the rocks. The glacial drift is accounted for by the transporting power of floating ice, the land being supposed to have been pretty generally submerged. The excitement produced by the discovery of gold in California and Australia led to the report of similar finds in Nova Scotia, but the opinion is expressed that the finds were not authentic and that some mistook pyrite for gold. "Quartz veins, however, occur abundantly in some parts of the district, and it would not be wonderful if some of them should be found to be auriferous."

Later editions of " Acadian Geology " give a description of the gold deposits, and in the supplement to the second edition occurs a discussion of the age of the slates and quartzite with the conclusion that they are probably Cambrian. The relation of the granite intrusion to the auriferous veins also receives some consideration, and the suggestion is made that although granite dykes cut the quartz veins, the formation of the veins and the granite intrusions are roughly contemporaneous.

Shortly after the discovery of the auriferous veins the provincial government in 1861 commissioned Henry Poole to make a geological report on the gold districts in the western part of the province, and J. Campbell to report on those of the east. Poole visited the known discoveries and a great many other places where the Gold-bearing series was exposed, and in 1862 submitted a report in which he mentioned not only the places where discoveries had been made, but promising districts for prospecting. Campbell made two reports, one in 1862 and the other in 1863. He was the first geologist to recognize the real structure of the series. Others had regarded the alternate wide zones of slate and quartzite running east and west as successive interstratified beds, but Campbell was the first to observe that they were not a succession, but a repetition of beds. He observed that the strata in broad bands dipped alternately north and south at high angles, and concluded that they were folded in long lines of elevation or anticlines, which were parallel and had about the same trend as the coast. He observed too, a second folding, which produced a plunging in the long east and west anticlines. According to him the series was composed of two groups of rocks of great thickness, a clay slate group superimposed upon a quartzite group. The gold veins were observed to lie chiefly in the bedding planes of the lower group on the domed portions of the anticlines or where the anticlines plunged to the east or west. As the veins frequently crossed the bedding he regarded them as of later origin than the containing rocks. He called attention to the great erosion that had taken place and discussed the probability of finding valuable alluvial deposits. During his investigations he carefully examined the sands and gravels of a great many streams on the mainland and in Cape Breton and reported on the results. His second report was accompanied by a section across the Gold-bearing series from north to south, showing the folded character of the rocks.

Although Campbell, on account of the short time at his disposal, did not make a detailed examination of the rock structure, and thus in his section omitted many folds, yet much credit is due him for his close observation. By calling the attention of the public to the dependence of vein distribution on the structure of the rock he pointed out the great importance of a knowledge of the geology of the fields. The necessity of detailed maps showing geological structure was emphasized by later observers, and the seed sown by Campbell bore fruit in the elaborate maps and plans that have been produced by E. R. Fairbault of the Geological Survey, Canada.

D. Honeyman contributed a great many papers on the geology of the province to various periodicals and to the Nova Scotian Institute of Natural Science. Many of these deal with the lithology and distribution of the Gold-bearing series, the nature of the Gay River conglomerates, the distribution of surface boulders and the direction of their transportation.

T. Sterry Hunt spent a few weeks with A. Michel in the gold fields in 1867, and his report was published by the Geological Survey in 1868. In this report was given a description of the geology, the auriferous veins, and the methods of mining and milling, together with notes on the individual districts. Hunt was a strong exponent of the theory that the interstratified quartz veins were deposited on the sea bottom contemporaneously with the sands and clays. In his description of the individual districts he gave the salient geological features, and the extent of the mining and development work that had been carried on and was in progress at the time.

A. R. C. Selwyn spent several weeks in the gold fields during the autumn of 1870, and his report appeared in the Report of Progress, 1870-71, Geological Survey, Canada. He pointed out the necessity of detailed and accurate mapping, considered the origin of the granite and its age, the age of the Gold-bearing series, the origin and structure of the auriferous veins, and the probability of the occurrence of valuable alluvial gold deposits. He suggested that the granite was formed by the fusion of the sedimentary rocks at a time later than the deposition of certain Silurian and Devonian rocks that exhibit alteration at points of contact. From a consideration of the mineralogical characters and physical aspect of the rocks, as well as from palæontological evidence, he concluded that the Gold-bearing series was of Cambrian age. He dealt at considerable length with the question of the origin of the veins, strongly opposing the theory that they were contemporaneous, and agreeing with Campbell in the opinion that they were formed by infiltration into crevices formed along the bedding planes. He was of the opinion that, on account of the extensive erosion that had taken place, scientific and persevering exploration would reveal placers that could be worked with profit.

Some very careful and detailed field work was done in the early years of the gold industry by H. Y. Hind. He was commissioned by the Legislature to report on certain gold districts. Reports were made on the gold districts of Waverley (1869), Sherbrooke (1870), and Mount Uniacke, Oldham, and Renfrew (1872), and these were accompanied by sections and large scale plans in which the topography, the rock structure, and the location of the veins were represented in detail. The geology of the districts was described, as well as the veins and the work that had been done on them, and suggestions of economic importance were given with reference to the development of pay-streaks and to metallurgical operations. The question of the decline of the industry also received his consideration. Although he acknowledged that the folding processes effected much change in the structure of the interstratified veins, and a certain amount of rearrangement of the mineral constituents was brought about, yet he was of the opinion that the most of these veins were contemporaneous with the rocks. So convinced was he of this that he considered the possibility of correlating the quartz veins of one district with those of another. He regarded the great masses of granite as really metamorphosed sedimentaries of Laurentian age, and the gneisses and schists, lying adjacent to the granite and now known to be metamorphosed equivalents of the slate and quartzite, were regarded as of Huronian age, and intermediate in point of time between the granite and Gold-bearing rocks.

In 1881 an arrangement was made by which the provincial government was to share with the Geological Survey the cost of a thorough topographical survey of the Nova Scotia gold fields, and to that end work was begun at once by Wm. Bell Dawson, but was discontinued at the end of the year because funds were not provided by the local government for further work. From his work, topographical maps were made of the area including the districts of Lawrencetown, Waverley, and Montague, and large scale maps of these districts were also made, but none of them was published.

In 1890, work was begun by L. W. Bailey, for the Geological Survey, in the southwestern part of the province, and was continued for several summers. Details of his work will be found in some of the Summary Reports, but more particularly in the Annual Report of the Geological Survey, volume VI, part Q, and volume IX, part M. These reports are accompanied by geological maps on the scale of 8 miles to 1 inch. The report part M, volume IX, which is more detailed than the other, describes the geology of the southwestern part of the province. Some attention is given to the topography and the surface geology, and to the dependence of the country's industries on the character of the glacial deposits. The rocks of different areas are described and the sedimentaries are divided into three great divisions, "Black Slate," "Banded Argillite," and

"Quartzite." The metamorphic rocks near Yarmouth which had been considered by some as possibly of different age from the slates and quartzites, received close study, and the conclusion was reached that they are only altered equivalents of the Gold-bearing series. The report closes with a brief description of the most important mining districts.

Detailed work was done by J. E. Woodman in Moose River district, and his description of this district is accompanied by photographs, diagrams, sections, and plans showing topography, geological structure, and the location of the veins. The geology, mineralogy, and vein structure are minutely described. Woodman has also contributed other papers on the Gold-bearing series in one of which he gives suggestions as to classification and in another of which he discusses the question of age.

The man who has contributed more than any other to our knowledge of the gold fields of the province is E. R. Faribault of the Geological Survey. He has spent many years in studying the geology and ore deposits, and in mapping and constructing plans and sections, and is today regarded as the authority on the subject.

The map of the province is being published in a series of sheets, each of which represents an area 18 miles by 12 miles, is numbered, and bears some characteristic name, as " Windsor Sheet," " Tangier Sheet," etc. Most of the sheets are accompanied by transverse, geological sections. On these sheets—which can be procured by applying to the Geological Survey, giving the number of the one desired, or stating the particular locality of which a map is wanted—are marked the geographical features, culture, and geology. The elevation of lakes, points on rivers, hills, and important places are given on those of more recent publication. Geological boundaries, dips and strikes, the synclinal and anticlinal axes, faults, the quartz veins, and ore deposits are shown. Peat bogs, swamps, roads, buildings, etc., are indicated. Plans and sections of the important mining districts are published on the scale of 250 feet to 1 inch, or 500 feet to 1 inch. They show the roads, houses, mills, and the blocks and areas. The geology is given in detail, with the dips, strikes, and faults. The quartz veins, auriferous and non-auriferous, are indicated, together with their dip, the dip of the rolls and the direction of the pay-streaks, the thickness of the veins, and location and depth of shafts that have been sunk on each. These plans have proved of the utmost value to the mining man in giving the detailed structure of the district and in enabling him to arrive at definite laws regarding ore deposition. The intimate study of the districts, made during the preparation of these plans and previously, led to Faribault's proposing the ore-shoot pay-zone hypothesis, to be described later.

In addition to the above plans he has also prepared sections of some important mines such as the Libbey, the Bluenose, the West Lake, and the Dolliver Mountain.

In the Annual Report of the Geological Survey, 1886, volume II, part P, appears a report on the Gold-bearing rocks of the eastern part of the province. In this Faribault deals in some detail with the geology of the section. The Summary Reports of subsequent years give much detail of the geology of the country surveyed, and those published since 1897 contain much information acquired from an intimate study of the individual districts.

In a paper entitled "Gold Measures of Nova Scotia and Deep Mining," read before the Canadian Mining Institute in 1899, and illustrated with maps and sections, he gives in a nutshell the conclusions he has drawn from his many years of painstaking research. In this paper he points out the resemblance between the interstratified veins of Nova Scotia and the Bendigo saddle-reefs, develops his pay-zone theory, and advises the initiation of a policy of deep mining. This paper has been reprinted by the Nova Scotia government in the "Annual Report on the Mines (Nova Scotia)" 1926. In a report made in 1903 for the provincial government on the problem of deep mining, he reiterates his belief in the possibility of profitable mining at great depths in Nova Scotia, and gives hints as to the best way in which the government can secure the desired end in lending assistance to the introduction of such a policy.

In addition to the above work Faribault has also constructed block and glass models of gold districts, showing the rock-structure and ore distribution: one of the Goldenville district exhibited at the Paris Exhibition in 1900, and at present in the National Museum of Canada at Ottawa, and another of the same district constructed on plate-glass with the assistance of J. A. Robert, and exhibited at the St. Louis exhibition in 1904. The latter has since been placed in the Canadian mineral exhibit at the Imperial Institute, London, England, and a duplicate of it is in the possession of the Mining Society of Nova Scotia at Halifax.

In 1905 T. A. Rickard was employed by the provincial government to report on the gold mining in the province. The report was published in 1927 by the Department of Public Works and Mines in the Annual Report on the Mines 1926. The report criticizes comparisons that had been made between the auriferous veins of Nova Scotia and the saddle reefs of Bendigo, Australia; it also criticizes the pay-zone theory and states that

> "Nova Scotian gold mining in the future, as in the past, must depend mainly on the small enterprises of practical miners, whose chief capital is muscle and experience. The small shoots of rich ore, found either on the domes or along the crumples formed by the complex folding, are well worthy of search and of development, but they do not warrant a big equipment, extensive development, or the investment of large sums of money."

In addition to the reports already mentioned, the literature of the subject is replete with reports made by competent geologists, such as Silliman, Hind, and Campbell, for various mining companies. One of the earliest of these, the report on Tangier district, by B. Silliman, 1864, is a classic, and many are of value for their detail and for the insight shown by the writers into the character of the ore deposits and the economic conditions.

Much that is very valuable has also been contributed by practical mining men such as J. E. Hardman, W. H. Prest, Percy E. Brown, H. S. Badger, Geo. W. Stuart, A. A. Hayward, F. H. Mason, and J. C. Murray, to the Mining Society of Nova Scotia, the Canadian Mining Institute, and the Nova Scotian Institute of Science, and to various periodicals. Recent papers by Sir Stopford Brunton have aroused discussion.

Much is recorded in the annual reports of the Department of Mines for Nova Scotia concerning the extent of the sinking, driving of levels, stoping, and crosscutting in different mines, in addition to statistics of production. Many of these reports contain timely suggestions and remarks on the different features of the industry, and the reports of such inspectors as H. S. Poole and E. Gilpin, jun., are of importance.

At different times since the discovery of gold several concise and interesting reports on the gold fields have appeared. In 1868, Heatherington published his "Gold Fields of Nova Scotia," which gives a history of the discovery of gold and of the progress of the industry in the different districts. In the same year appeared How's report to the provincial government on the "Mineralogy of Nova Scotia," containing a description of the geology and the gold deposits, as well as a brief statement of the status of the industry in each district. The Report of the Department of Mines for 1874 contains a pointed inquiry by H. S. Poole into the cause of the decline of gold mining in Nova Scotia, and the same author contributes to the report for 1878 a strong argument in favour of the theory that the veins are of later age than the rocks. E. Gilpin, jun., has also contributed much to the literature of the subject. "The Mines and Mineral Lands of Nova Scotia," 1880, "Ores of Nova Scotia," 1898, and "Minerals of Nova Scotia," 1901, summarize the facts concerning the geology and the quartz veins, touch upon the question of alluvial mining, and give an outline of the work done in each district, together with its production. His "Gold Fields of Nova Scotia" in the Transactions of the North of England Institute of Mining Engineers, volume 31, 1882, is a good treatment of his subject and in the Proceedings of the Royal Society of Canada, volume VI, part IV, page 83, is to be found a discussion concerning the origin of the gold.

W. H. Prest has contributed to our knowledge of the glacial geology of the district, and R. A. Daly and J. W. Goldthwait have treated of the physiography of the province. Many other writers have studied various phases of the subject, and written papers of more or less practical or scientific interest.

SUMMARY AND CONCLUSIONS

GEOLOGY

The area is underlain by a series of sedimentary rocks and igneous intrusives.

The sedimentary rocks consist of 16,000 feet of quartzites and interbedded slates overlain conformably by 14,500 feet of slates. They are the Gold-bearing series; the lower or quartzite division is known as the Goldenville formation and the upper division as the Halifax formation. They are folded in long anticlines and synclines having their axes nearly parallel to the Atlantic coast. The anticlines, which are on the average 3 miles apart and from 5 to 100 miles long, plunge at intervals to the east and west, forming domes. The domes on any one anticline are 10 to 25 miles apart.

The Goldenville formation is exposed along the anticlines and the Halifax formation forms easterly trending belts lying in the synclines. The beds dip at high angles and in places are overturned. Numerous faults cut the series in a northwest direction and the horizontal displacement in some cases exceeds one mile.

The series is probably of Precambrian age.

The igneous rocks, with the exception of a number of narrow basic dykes, are granites. They vary much in texture and composition, being in some places a medium-grained muscovite granite and in many places a coarse-grained porphyritic biotite granite with large phenocrysts of feldspar. They have induced intense alteration of the intruded Gold-bearing series at and near the contact.

The folding of the sediments and the intrusion of the granites, which took place during the Devonian period, were succeeded by a long period of erosion and the granites were unroofed before the sediments of the Horton series of the Carboniferous system were laid down.

Erosion reduced the area to a peneplain and the present topography is that of a slightly tilted tableland nowhere exceeding a few hundred feet in elevation. The whole was subjected to glaciation during the Glacial period.

Ore Deposits

The gold occurs in quartz veins in the Gold-bearing series. Most of the veins lie in the stratification planes of slate beds of the Goldenville formation, but a few important veins cross the strike of the sediments. They are found on domes and plunging anticlines and the outcrops form a series of concentric ellipses or portions of ellipses. Some veins have been traced around the arch of the dome from one limb to the other, and underground work in some districts has revealed the presence of a series of saddle veins that do not come to the surface.

Many of the interbedded veins are strongly corrugated. On the sides of the dome the corrugations parallel the strike of the vein, but towards the end of the dome they pitch at an angle between the dip and strike and assume large proportions, so that the term barrel quartz is applied. Inclusions of slate fragments and interlaminations of thin films of slate are common.

The gold occurs in shoots which pitch at a low angle to the east or west. The location of the shoots appears to be determined by some irregularity of rock structure such as a subordinate flexure in the fold or a fracturing of the strata.

Most of the gold is free-milling, but the arsenopyrite, found in considerable quantities in some veins, carries gold that is not amenable to amalgamation.

It is evident that the deposition of the ore is dependent on the rock structure. It is believed that during the folding processes there was a slipping of the beds one upon another with a consequent fissuring along the bedding planes of the slates, the less resistant rocks. During the opening of these fissures deposition of auriferous quartz took place in those parts where the fracturing of the rock was sufficient to permit the passage of the solutions. The problem of the origin of the solutions has not been satisfactorily solved. Two theories have been advanced, one that the veins were filled by the lateral secretion of auriferous solutions and the other that the minerals were deposited from ascending thermal solutions. The latter is the more generally accepted theory.

Future Possibilities

There is reason to believe that the auriferous veins have not been exhausted.

Most of the mining of the early days was carried on by individuals who had not sufficient capital to carry operations to any considerable depth, and those who had capital at their command allowed themselves to be governed too frequently by the prevailing idea that the deposits are superficial. Later operations have revealed the presence of rich ore in mines that were for these reasons abandoned in the early days.

Ore-shoots are frequently found in a series of veins in parts of domes that have been affected by some irregularity of structure. Where this irregularity of structure extends downward through the sediments parallel to the axial plane of the anticline it is reasonable to suppose if the ores had their origin in ascending thermal solutions that the series of deeper veins are auriferous as well as those exposed on the surface. It is suggested, therefore, that close attention be directed to those peculiar features of structure that seem to have been intimately related to ore deposition and that search for ore-shoots be made in all veins affected thereby.

CHAPTER II

GENERAL CHARACTER OF THE DISTRICT

GENERAL ACCOUNT

Regional. The Gold-bearing series and the granite batholiths form a detached part of a sloping upland that stretched at one time unbrokenly from the Atlantic coast of Nova Scotia northwest into the highlands of New Brunswick and Gaspe peninsula and northeast into the tablelands of Newfoundland. This upland of the Atlantic coast of Nova Scotia is one of an important series of uplands having an accordance of summit levels and separated from each other by lowland areas of erosion. The surface of the main upland, of which these large fragments remain, cuts across the complex geological structure of the region and is explained as a plain of denudation formed by the wearing down of mountains to a broad lowland. Regarding this Goldthwait writes:

> "Inasmuch as this Atlantic upland now rises from sea-level along the southern coast of Nova Scotia to 1,200 feet on Cape Breton island and 1,500 to 2,000 feet in Newfoundland, it is evident that, whether it originated as a plain of subaerial denudation or as a submerged surface of marine denudation, it has gained its present altitude through a general upwarping of the region.
>
> The division of this once continuous plain into its several fragments has been accomplished since its elevation, and mainly, if not wholly, by rain and rivers hollowing out those parts of the uplifted plain which were occupied by the least resistant rocks. Over hundreds of square miles in Cumberland and Colchester counties, where soft shales and sandstones of the Carboniferous system occur at the surface, lowlands of great extent have been worn down, developing a new plain which lies from 300 to 500 feet below the level of the upland and completely surrounds the resistant mass of the Cobequid mountains. In northern Annapolis county, where a belt of soft sandstones lay between an inclined bed of lava and a great mass of granite, the surface was excavated by rain and rivers, making the deep, wide trough of Annapolis valley, whereas the more resistant lava sheet, lying between it and the lowland belt of the bay of Fundy, remained as the high, even-topped ridge known as North mountain. On Cape Breton island, where patches of granite and other hard rocks alternate with infolded strata of a more yielding character, these weak rocks were eaten away, leaving several belts of smooth-crested mountains and one broader tableland.
>
> The disconnexion of the Cape Breton tableland from that of Newfoundland dates from this same period of denudation. The great canyon of the St. Lawrence, now so deeply submerged that it shows only on a submarine map, was carved out by the powerful river while it was flowing down the southeastward slope of the uplifted plain, reaching the sea at Cabot strait, 175 miles southeast of the present Cape Breton island. On the south side of this great canyon, between the granite area of Cape Breton island and the granite areas of New Brunswick and Gaspe, an immense region of soft sandstones, similar to and continuous with those of the Cumberland lowland, was reduced to a great, smooth plain, which shall be called the Acadian plain. Near its curved upper margin, a somewhat more resistant stratum of sandstone projected as a low, crescent-shaped ridge, and, far out on the plain, 50 miles northwest of the Cape Breton tableland, a small group of volcanic masses formed a low cluster of rounded hills. Within the areas of hard rocks, as they remained standing above the deepening lowlands, valleys were cut—valleys which in the lower areas on the south were as a rule broad and shallow, but in the higher tablelands and mountains of the north, particularly at their steep borders, were deep and gorge-like.

At length the whole region sank, letting the sea creep in over the lower, outer part of the dissected upland and spread widely over the new lowlands. By the time the subsidence had ceased, the sea had pushed the outer shoreline inland nearly 100 miles from Sable island to its present position, converting the outerhalf of the upland into 'banks,' and flooding the mouths of the valleys all along the shore, so as to form irregular bays. Off the coast of Newfoundland, east of the old mouth of the St. Lawrence, an area equal to that of the present island became the 'Grand Banks.' The St. Lawrence canyon was converted into a broad gulf, and the irregular tributary valleys of Cape Breton island became crooked arms of the sea—the Bras d'Or lakes of today; the great saucer-shaped Acadian plain was flooded almost to its upper border, leaving only a crescentic line of hills to project as Prince Edward Island; and the little group of rounded hills farther north became the Magdalen islands."

Local. The gold-bearing area of Nova Scotia may be regarded as a low-lying plateau with a southeasterly slope towards the Atlantic and with a general elevation seldom over 500 feet. In the west the long escarpment of South mountain forms the northern edge of this plateau, in the east a decided ridge extends along the northern boundary from cape Canso to Musquodoboit river, and a break is made in the general slope by the swinging of the divide near the centre of the province southward to within a few miles of Halifax. The whole surface is composed of gently undulating hills, and rarely is the even sky-line broken by conspicuous individual elevations. In contrast with the rounded, much denuded undulations stand the deeply incised river valleys, through which torrents dash over rapids and cascades with all the appearance of youth.

[1]"Thus the plateau is to be regarded as a single great topographical facet above which rise local cameo-like reliefs in the form of a few residual hills. It also presents the appearance of having been carved in intaglio. Sunk beneath the facet are many deep, narrow, and steep-sided valleys in the north, typified by the gorges of Bear river, Gaspereau river, the upper Shubenacadie, and East river; in the south the bedrock valleys are shallower and have been in large part filled by drift, with the result of obscuring their preglacial form."

DETAILED ACCOUNT

Relief. As has been pointed out, the general slope of the southern plateau is to the southeast. Although prominent ridges are absent and conspicuous single elevations rare, there has been enough differential weathering to give to the whole plateau an undulating character. The granite has offered greater resistance to weathering than the sediments and thus the granite batholiths form somewhat more prominent features of the topography than the surrounding sediments. The two highest points in the gold fields are in rock of this kind: one is 2 miles west of McGee lake, south of Kentville, and the other is Armstrong hill, a short distance west of Windsor-Chester road, each having an altitude of 800 feet. Other elevations determined are: on South mountain at Canaan, south of Kentville, slate, 755 feet; on South mountain south of Wolfville, and one mile east of Newtonville, slate, 750 feet; mount Ardoise, slate, 738 feet; on Windsor-Chester road, near Carding lake, granite, 728 feet; Broom hill, one mile west of New Ross, granite, 715 feet.

---

[1] Daly, R. A.: "The Physiography of Acadia" ;Bull. Mus. Comp. Zool. Harvard College, vol. XXXVIII Geol. Series, vol. V, No. 3, p. 77.

The slope is towards the south, but within a short distance of the Atlantic coast elevations of 300 or 400 feet are common.

Differential weathering has manifested itself to a certain extent in the sediments. Ridges of quartzite tending in a northeasterly direction alternate with valleys eroded in the slate.

The topography was modified by glacial action of which there is abundant evidence in the smooth, polished rock faces, striæ, grooves, travelled boulders, and moraines. The striæ have a southerly direction and boulders of amygdaloidal trap from North mountain and of granite, syenite, and gneiss from Cobequid mountain are found along the Atlantic coast—satisfactory evidence of a general movement of the ice-sheet southward. Somewhat difficult of explanation is the occurrence on South mountain of innumerable boulders of granite resting on the slate and quartzite to the north of the great granite mass. The suggestion of local glaciation towards the close of the Glacial period has been offered.

The most marked effect of the glaciation is the extensive denudation of the Gold-bearing rocks; great stretches of rock are laid bare and over the greater part of the area the soil is thin, covered with boulders, and lacking in fertility. Granite and quartzite, being more resistant than slate to the weathering agencies, opposed somewhat more prominent barriers to the onward movement of the ice, and thus were more thoroughly denuded, and were worn and polished into rounded hills and roches moutonnées. So completely was the soil removed from the granite hills that some areas are almost devoid of vegetation, and others have barely enough to support a forest growth.

"In addition to ordinary striations, evidences of furrowing and ploughing are also met with, and in some instances to a depth which is very remarkable. Thus, at the extremity of the island on which Lockeport is situated, alternating beds of quartzite and slate, dipping steeply to the sea, are ploughed along their edges into canoe-like troughs, 30 or 40 feet long, 3 or 4 feet wide, and as many deep; while on a small island near Port Latour, similar beds have been gouged by a like agency to a depth varying from 10 to 20 feet."

Although numerous worn boulders of trap from North mountain and of gneiss, granite, and diorite from Cobequid mountain are found in the glacial till along the Atlantic coast, the large proportion of the boulders possesses a decidedly local character. Here and there blocks of granite are found that have travelled a few miles, but the fragments generally belong to the formation on which they lie; belts of quartzite are overlain by quartzite boulders, belts of slate by slate debris, and granite areas by granite boulders. So generally is this the case, that, where the contacts between different rocks are concealed by drift, geologists have often based their determination of the boundary on the distribution of the angular boulders.

Glacial deposition is more marked along the Atlantic coast west of Halifax than in any other part of the era, and in many parts morainic development is a very conspicuous feature, giving the topography a beautiful undulating character as seen in the vicinity of Chester.

"Of ordinary terminal moraines, the interior of Queens, Shelburne, and Yarmouth counties affords many examples, and to their presence and influence many features in the drainage of the country are no doubt due. The headwaters of Port Medway, Liverpool, Jordan, and other rivers, may be cited in illustration.

In addition to moraines, the peculiar accumulations known as kames or 'Horse-back,' are abundant in southwestern Nova Scotia, and are, in some instances, of remarkable character."

A ridge, probably of this nature, crosses the Liverpool and Annapolis road in Maitland settlement, extends eastward across Maitland river to Gull lake, and then turns northerly by Gull Lake stream to the south of Perrot settlement; in the opposite direction it extends westward by way of Long lake to Frozen ocean, finally crossing into Digby county. Kames are found also in Shelburne county. They are several miles long, "somewhat tortuous in their course, but with a general southerly trend, are from 20 to 40 feet high, and are usually just broad enough at top to afford room for a roadway." The most remarkable of these ridges is the so-called "Boars back" of Digby county, which is 20 miles long. "As usual this kame consists of sand and gravel, with some embedded boulders, and also, as usual, it is bordered on either side by extensive low and flat tracts." These glacial deposits are often short and spindle-shaped and arranged in a series of parallel and overlapping lines, and in some cases they bifurcate. [1]In some cases they include a number of round, deep depressions or "kettles," as on the road from Shelburne to lake John, east of Jordan river.

A conspicuous feature[2] of the landscape at the head of Port Mouton harbour, Queens county, and along portions of the shore of Barrington bay, Shelburne county, is the series of sand dunes that appear at a distance like great drifts of snow. They conceal for the most part the underlying rocks. The sand is pure and white, and is so incoherent as to be readily blown about by the wind. The dunes on Barrington bay cover 15 or 20 acres, and reach their highest elevation, 40 feet, near their inner edge. The hills are slowly travelling inland and burying the vegetation in their path.

The Atlantic coast is characterized by numerous indentations from 2 to 7 miles long and from one-half to 3 or 4 miles wide. Many have sides that are approximately parallel; others widen into bay-like forms. They were formed by the submergence of the lower ends of the river valleys when the coast subsided and have the general southeast trend of the river valleys. At the west end of the province the coast is more regular, and from Port Maitland to Meteghan it rises in places in precipitous bluffs 200 feet high. Here the slates are steeply inclined, strike seaward, and are carved by the waves into fantastic shapes; chimneys are detached from the mainland and there are many caves.

Islands are numerous. Many of them are rock-bound, but towards the southwest great numbers, like those of Mahone bay, are composed wholly of glacial drift.

Drainage. The larger rivers are approximately parallel and follow pre-Glacial valleys trending to the southeast and south in accordance with the general slope of the country. In many places they expand into lakes and in the course of their descent receive the overflow from lakes occupying transverse valleys formed by differential erosion. Some of the streams such as Sheet Harbour and Country Harbour follow great cross-country faults and have very straight courses.

---

[1] Bailey, L. W.: Ann. Rept., Geol. Surv., Canada, vol. IX, pt. M, p. 13.
[2] Bailey, L. W.: Trans. of the Nova Scotian Inst. of Sci., vol. IX, p. 180.

Although glaciation had no very marked effect on the general drainage, in the minor details it produced great changes by scooping out alluvium-filled hollows and blocking pre-Glacial valleys. Thus catchment basins were formed and became filled with water. The lakes are small, generally shallow, and dotted with islands.

For a detailed description of land forms, glaciation, shore-lines, and questions of submergence the reader is advised to consult Memoir 140 of the Geological Survey, Canada, "Physiography of Nova Scotia", by J. W. Goldthwait; and "The New England-Acadian Shoreline", by Douglas Johnson.

CHAPTER III

GENERAL GEOLOGY

Table of Formations

Post-Glacial	Sands, clays, and gravels, redistributed by steam action; peat
Pleistocene or Glacial	Sands, clays, and gravels
Lower Carboniferous	Limestone, sandstone, and shale
Devonian	Granites; porphyritic, coarse-grained biotite granite and fine-grained muscovite granite
?	Basic intrusions in the form of sills and dykes
Precambrian?=Gold-bearing series	Halifax formation..Slates of various colours and textures Goldenville formation....Interstratified quartzites and slates.

DESCRIPTION OF FORMATIONS

Gold-bearing Series

DISTRIBUTION

The two formations of this series are both widely distributed throughout the gold fields. East of Halifax the Goldenville formation occupies over three-fourths of the area, the Halifax formation overlying it in long, narrow zones extending east and west. West of Halifax the two formations are about equally distributed, and the quartzite lies in zones, or elongated ellipses, having a northeast and southwest extension.

LITHOLOGICAL CHARACTERS

Goldenville Formation. This formation includes all varieties of terrigenous sediments from fine muds to coarse sandstones and conglomerates, but quartzite predominates, and on this account it is frequently designated the quartzite formation or group. The conglomerates are of very limited extent, and are found chiefly in the west. Alternating bands of quartzite and slate prevail. Although slate is distributed throughout the whole formation, there are, in some parts of the field, certain horizons in which it is somewhat more abundant than in others. It has been estimated that the slate forms 3 per cent or less of the total thickness exposed.

The quartzite is a fine-grained, dense rock with a smooth, conchoidal fracture, and with a colour variously described as uniform grey, bluish grey, dark green, and greenish grey. It consists chiefly of quartz, but some mica is visible and some beds are heavily charged with pyrite and mispickel, which frequently occur in large crystals. The weathered surface is stained by the oxidation of pyrite and arsenopyrite, or is light grey to white. In places it is quite fissile and approximates a quartz schist.

The description given by [1]Jackson and Alder is interesting:

> "It is composed, as its name indicates, of siliceous matter, or quartz, which is fine granular, but more frequently compact, and breaks, not unusually, with conchoidal fracture. It is sometimes white, and its grains are transparent; but it generally has a greyish or bluish tint."

In describing some of the quartzite of the western end of the province they speak of it as "a fine, fragmentary rock, consisting of granular quartz and feldspar united with grains of serpentine of a dirty green colour." Woodman points out that some beds that are of the nature of arkose contain considerable kaolin: the whole body has frequently been designated feldspathic quartzite. W. J. Wright states that whin from Lahave valley is composed mainly of quartz and feldspar and is, therefore, not a true quartzite. From a study of these rocks in Halifax and Colchester counties, Woodman finds that a microscopic examination shows that[2]

> "secondary deposition of silica is slight, while chlorite and muscovite are developed somewhat; calcite is abundant, giving free effervescence with acid. . . . In some cases it is not possible to tell whether the muscovite is fragmental or secondary, because of the small size of the particles. Occasionally the sediments become chloritic schists or mica-schists, and in many more instances the microscope reveals distinct schistosity in a minute way."

Faribault is of the opinion that Woodman's remarks regarding the development of calcite refer to only a few beds and are not of general application.

The origin of the calcite is not known. Three explanations suggest themselves, namely, that it is original, being the result of organic agencies, that it was introduced by infiltration, or that it resulted from the decomposition of the feldspathic components.

Of the slate belts of the Goldenville formation [3]Faribault states that

> "the principal varieties of slate are light-grey glistening mica-slate, almost wholly composed of mica; dark-bluish, papery, shining, fine micaceous slate; dull-grey, dirty, rusty, arenaceous. earthy slate; greenish, soft, unctuous slate with little mica; and bluish black or dark bluish grey, compact, siliceous slate, generally metalliferous and holding arsenical and iron pyrites in crystals or nodular masses, principally in the vicinity of auriferous quartz-veins, with which they are often associated."

[4]Woodman says,

> "their colour is usually a bluish or greenish black, often altered by chlorite to a somewhat lighter green, or by the rusting of sulphides to a brown. Their commonest surface colour when well weathered is grey. . . . The rock is in places graphitic, but not commonly, or so noticeably as in the overlying formation."

He finds that at Moose River the pyrite in the slate lies chiefly along the bedding planes. Chalcopyrite also occurs in small quantities.

In some places there is no sharp line of division between the quartzite and the slate, one passing gradually into the other.

---

[1] Remarks on the Mineralogy and Geology of Nova Scotia", 1833, p. 321.
[2] Proceedings of the Boston Society of Natural History, vol. 28, No. 15, p. 377.
[3] Geol. Surv., Canada, Ann. Rept., vol. II, pt. P, p. 146.
[4] Am. Geol., July, 1904, p. 17.

In addition to the quartzite and slates, there is subordinate development of grits and conglomerates. Hind mentions that, at some depth in the formation, coarse sandstones passing into a grit occur at Mount Uniacke and Waverley, and at the mouth of St. Mary river. At Mount Uniacke a belt 380 feet thick is very coarse at the base and passes upward into a very fine sandstone.

Halifax Formation. This formation consists chiefly of slates of various textures and colours, a few siliceous, flaggy beds and a very small amount of limestone.

The limestone, which is of an arenaceous, dolomitic character, has been seen at two points at the base of the formation. On the shore at Southeast Passage post office it is found in a crystalline state interstratified with quartzite, in a belt several feet thick. It can be seen only at low tide, and lies just south of Wm. Wells' house. A bed 3 feet thick is found at the same horizon near Preston Road post office, and was burned by the early settlers for lime. Almost anywhere east of Halifax, effervescence with acid shows the presence of calcium carbonate in a few beds at the base of the formation.

A few layers of more or less calcareous greenish slate of fine texture and with a soft, smooth feel are found at the base of the formation at different points in the eastern part of the province, and pass insensibly into the overlying black slates. The great mass of the Halifax formation in the east consists of

> [1] "bluish-black, ferruginous, and graphitic slates, easily distinguished from and unlike any others in the province, having a characteristic fibrous texture. Certain flinty layers are full of arsenical and iron pyrites distributed through the mass in small, perfect crystals."

The pyrite is frequently found in crystals along the bedding planes. Pyrrhotite is found in some beds, for example, near the limestone on the shore at Southeast passage.

In the western part of the province there is a greater variety of slates, and Bailey found it advisable to make three great divisions of the rocks of the Gold-bearing series, but as his upper two divisions consist of argillaceous rocks and as the series has been divided by most geologists in two great groups or formations, it seems preferable to retain the two-group classification. According to Bailey, the lithological characters of the formation are as follows:

ASCENDING SUCCESSION[2]

"I. *Quartzite Division:*

(*a*) Heavily bedded bluish quartzites, alternating with much thinner beds of grey argillite.

(*b*) Greenish grey sandstones or quartzites, somewhat chloritic and less massive than in (*a*), and alternating with slates which are arenaceous below, but become progressively more argillaceous above.

---

[1] Fairbault, E. R.: Geol. Surv., Canada, Ann. Rept., vol. II, pt. P, p. 147.
[2] Geol. Surv., Canada, Ann. Rept., vol. IX, pt. M, p. 28.

> "II. *Banded Argillite Division:*
>
> (*a*) Greenish grey slates, becoming bluish or light-grey, and passing upwards into—
>
> (*b*) Purple slates, marked in the lower beds by pale yellowish green seams, with faint bedding lines, which are wanting in the higher beds.
>
> (*c*) Bluish grey and grey slates, often with cloudings of green, purple, lilac, buff, or yellow, in places exhibiting a conspicuous banding or ribbanding of the beds.
>
> "III. *Black Slate Division:*
>
> Black with some blue or grey slates, often studded with cubes of pyrite, and very rusty-weathering."

Speaking of the purple banded slates, Bailey says,[1]

> "The ribbanding is often very conspicuous and the colours varied, including lilac grey, bluish grey, greenish grey, buff, purple, light grey, and white, the proportion being in the order named." [2]"Wherever seen the yellowish green seams show faint bedding lines, which here and there are discontinued or replaced by purple slate for half an inch or an inch."

In Kings county a thick series of banded slates, greenish grey in colour and with narrow, siliceous bands of a lighter grey is exposed on Black river, a tributary of the Gaspereau. At a lower horizon are found some rather siliceous beds a few inches in thickness, which show very fine cross bedding. Correlation of the strata of the west with those of the east presents some difficulties, but Bailey's upper division corresponds closely with Faribault's ferruginous, graphitic division of the east, it being nearly always dark and often intensely black, and graphitic, with an abundance of pyrite. It is possible that the "banded argillite division" of the west, although several thousand feet thick, corresponds to the few layers of greenish, argillaceous, and chloritic slate of the east found on Rawdon mountain and the hills between Musquodoboit and Stewiacke river. The greater development in the west may be due to the greater proximity of that part of the ancient sea to the continent, and the banding may mark seasonal changes.

STRUCTURAL RELATIONS

The unravelling of the structure of the Gold-bearing series is by no means a simple undertaking. Only one horizon, the boundary between the two formations, can be traced throughout the field, and, whereas in the eastern part this boundary is sharp and distinct, in the western part transition from the Goldenville to the Halifax formation is much more gradual.

The structure of the Goldenville formation is rather easily deciphered. The strata are usually well defined and separated by films of slate, and numerous beds of slate varying from a few inches to several feet in thickness are interlaminated with the quartzite. The strike and dip can thus be determined with some degree of certainty.

Much greater difficulty is experienced in the study of the structure of the Halifax formation. The black, graphitic slates are very homogeneous, and the determination of the bedding planes is in many places almost impossible even to the most experienced observer. The alteration from muds to slates has obliterated nearly all traces of bedding and developed a marked cleavage that has in some cases been mistaken for bedding. In the vicinity of granite masses contact metamorphism has effected such a marked alteration of these rocks that it is sometimes quite futile to attempt to make out their original structure.

---

[1] Geol. Surv., Canada, Ann. Rept., vol. IX, pt. M, p. 37.

[2] Geol. Surv., Canada, Ann. Rept., vol. IX, pt. M, p. 80.

The presence of siliceous beds and of the colour bands that are found in the western part of the field are of great assistance in structural determinations.

Traverses made across the Gold-bearing series from north to south show a succession of alternate zones of rocks of the Halifax and of the Goldenville formations, varying in width from a fraction of a mile to several miles. In the eastern part of the field the quartzite zones are generally much wider than the slate, the zones extending in a general east and west direction. In the western part where they take a northeast and southwest direction the two formations are more nearly equal in width. The slate zones of the east take in general the form of much elongated ellipses surrounded by quartzite; in the west the zones of quartzite are elliptical in shape and surrounded by slate, the ellipses in the latter case being much broader than in the former.

In the east the zones of slate lie in the synclinal troughs of great east and west folds, along the anticlines of which the zones of quartzite are exposed. In some exceptional cases there is another folding within the slate belt by which the centre of the slate belt is brought up in an anticline, and even an elliptical outcrop of quartzite may be found, as at Caribou. The wide zones of quartzite are folded in many places into two or more anticlines from the troughs of which all trace of the overlying slate formation has been removed. The anticlines plunge to the east and west, and domes are numerous.

The chief difference between the structure of the east and that of the west is that in the former the folds are much more tightly compressed the strata commonly dipping at angles varying from 60 degrees to 90 degrees, whereas those in the west dip at much lower angles. Denudation has not reached to such low horizons in the west as in the east, and whereas in the east the Halifax formation has been eroded not only from nearly all anticlines, but also from the troughs of some synclines, in the west the Halifax formation has been eroded only sufficiently to expose the Goldenville formation on the anticlines and generally only on broad, nearly circular domes.

The maps published by the Geological Survey on the scale of 1 mile to 1 inch show the location of the anticlines and synclines, together with the dip and strike of the strata as determined by careful observations in the field, extending over a period of many years. The anticlines, though approximately parallel, vary a great deal in length—from 3 or 4 miles in some of the local folds to about 105 miles in the Waverley-Moose River-Upper Seal Harbour fold. In some cases two anticlines unite to continue as one, several subordinate crumples being formed at the place of union, as is the case with the Fifteenmile Stream and Beaver Dam anticlines uniting at Moose River. In some cases one anticline dies out only to be succeeded a short distance to the north or south by another that continues in the same general direction as the first, and that may properly be considered the continuation of the first as in the case of the Waverley and Moose River folds. In some cases an anticline, like the Mount Uniacke-Renfrew, is broken up into a series of short folds arranged *en échellon*. Subordinate crumples a few miles in length on the limbs of the main anticlines are exceedingly common. The folding is thus seen to be very complex, and the correlation of a fold in one part of the field with that in another must be regarded as unreliable, unless they have been actually traced and found to be parts of the same fold.

Although the limbs of the anticlines dip at high angles and are frequently overturned, the plunge to the east or west is seldom more than 30 degrees, and is generally much less. At Montague the plunge is west 5 degrees and east 5 degrees, at Tangier west 12 degrees, at Harrigan Cove west 8 degrees, at Lake Catcha west 28 degrees and east 25 degrees, and the north anticline at Isaac Harbour west 18 degrees. Few domes are as symmetrical longitudinally as that of Montague, the plunge at one end being greater than at the other, for example the dome at Leipsigate plunges west 15 degrees and east 30 degrees. The plunge also varies greatly within short distances. In Upper Seal Harbour district it is east 12 degrees at Isaac Harbour river, and east 23 degrees east of Upper Seal Harbour lake, within a distance of 2 miles; at Brookfield it increases from 10 degrees to 18 degrees east within a distance of 2,000 feet, and at Waverley, where the barrel quartz was mined, it increases from 5 degrees to 24 degrees west within 500 feet. There is no alignment of the domes in a direction different from that of the east and west folds, nor does there appear to be any regularity in their arrangement. It is probable that the plunging was produced at the same time as the main folds by a force acting nearly at right angles to the force producing the folds.

The following table of the most important anticlines and gold districts has been compiled by Woodman from the sheets published by the Geological Survey:

(1) [1]"The Tangier fold with Ecum Secum, Harrigan Cove, and Tangier; (2) the Ecum Secum fold, a very local one, with a part of Ecum Secum; (3) the Lake Catcha-Salmon River fold, including Liscomb Mills, Salmon River, and Lake Catcha; (4) the Mooseland-Gegogan fold, including Mooseland and Gegogan (Lawrencetown may be on a westward continuation); (5) the Wine Harbour fold with Wine Harbour; (6) the Montague-Isaac Harbour fold with Montague, Gold Lake, Killag, Goldenville, and Isaac Harbour; (7) the Moose River-Beaver Dam fold, with Beaver Dam, Upper Seal Harbour, Ragged Falls, and Moose River; (8) the Waverley-Fifteenmile Stream fold, with Waverlev at the west, running through Moose River, where it parts company with 7, to Fifteenmile Stream; (9) the Caribou fold, containing Caribou, Cameron Dam, Crowsnest, and Cochrane Hill; (10) the Oldham fold, with Oldham; (11) the South Branch Musquodoboit fold, with an unnamed dome and Little Liscomb Lake mine; (12) the South Uniacke fold, with South Uniacke; and (13) the Mount Uniacke fold, with Mount Uniacke and Renfrew."

Much difficulty has been encountered in determining the structure of the western half of the Gold-bearing series. This is due to the great proportion of the Halifax formation, to the scarcity of exposures in some sections as compared with the eastern half of the field, to the great degree of metamorphism that has taken place in the vicinity of the granite intrusions, and to the probable occurrence of numerous faults, some of which it is possible to trace in detail, as in that section south of Wolfville and Kentville.

---

[1] Trans., N.S. Inst. Sci., vol. XI, p. 165.

The most important feature of the structure is the exposure of the Goldenville formation in broad, elliptical domes. This is particularly noticeable in Lunenburg and Queens counties. The lateral compression has not been so great here as in the east and the strata dip at lower angles. The longer axes of the domes run northeast and southwest, and the domes run in approximately parallel lines, the anticlinal folds do not show the same continuity as in the east. There is a tendency for massive and inflexible beds of quartzite to exhibit the effects of great lateral pressure by forming in large and continuous anticlines. The more plastic beds of slate or shale, subjected to the same conditions, tend to form small crumples or anticlines of less extent and less continuity, and by responding more sensitively to the minor stresses manifest a great deal more irregularity than quartzites, rising in some places, as on South cove of Lunenburg harbour, in marked cross folds running north and south. In the western part of the field the domes of quartzite are surrounded by slates and a single fold in the quartzite frequently divides into two or three smaller ones as it passes into the slate.

As has already been pointed out, the strata in the eastern part of the gold fields are closely folded and dip at high angles. A few anticlines are fairly symmetrical, but most of them have their axial planes inclined away from the vertical. Most of the unsymmetrical folds have axial planes dipping to the north. In a few cases, as in Killag gold district, the fold is overturned, and rarely, as to the north of Fifteenmile Stream gold district, a succession of three or four folds exhibits a fan structure.

The series has suffered a great deal of faulting and the fractures may be grouped into two classes, cross-country faults and local faults.

The local faults are those that are found in the separate gold districts, and do not continue for great distances on the strike, and sometimes to only shallow depths. They seem to be closely related with the doming of the anticlines, and are very frequently found to radiate from the centre of the dome. Good examples of these are found in the eastern part of Oldham gold district.

The cross-country faults are those that can be traced several miles across successive folds. They form a series of breaks approximately parallel. In the eastern half of the gold fields and in Kings county the most important of these have been traced. In the western half either there have been few extensive faults or they have failed to leave such marked traces on the slates of this part as they have on the quartzites of the east, or it is impossible to trace them on account of the covering of drift. The faults that have been traced are practically all found to strike northwest and southeast at an angle quite removed from the perpendicular to the strike of the strata. Nearly all those in the eastern half of the field are known as left-hand faults, that is the displacement is such that a bed of rock followed to a fault can be picked up by turning to the left and following the strike of the fault. Those in Kings county, on the contrary, are right-hand faults.

In tracing these faults across the country the few datum planes available, such as the boundary between the two formations, or the bed of quartzite in the Halifax formation in Kings county, have proved of great service. Other phenomena that have been of assistance are brecciation, twisting of the strata, and the alignment of stretches of low ground and swales and of numerous cold water springs. In some cases the rivers and brooks have followed faults for varying distances, and rendered the determination of their location extremely easy. The faults have determined the remarkably straight courses of some of the rivers.

On account of the great homogeneity of the rocks much difficulty would be encountered in determining the exact direction and extent of the motion along the fault plane. It is very probable that displacements in all directions are represented: horizontal, vertical, and oblique. The obliquity of motion in some cases is plainly shown by the direction in which the strata are bent as they approach the break. In most cases, however, only the extent and direction of the horizontal displacements have been determined, and these are indicated on the map sheets.

Some of the most important of these faults are:

(1) One following the straight course of New Harbour river and giving a left-hand horizontal displacement along the strike of over a fourth of a mile.

(2) Country Harbour fault with a displacement along the strike of 1½ miles.

(3) Indian Harbour fault giving a displacement on the strike at the Wine Harbour anticline of nearly a mile, but probably less than a fourth of a mile just west of Crowsnest mine.

(4) One running northwest from Shears cove west of Harrigan Cove gold district, through Eagle lake and Salmon River Big lake, east of the granite mass exposed at Mulgrave hill, to the vicinity of Tenmile lake. This gives a left-hand displacement along the strike of a little over half a mile near the coast, but apparently a right-hand displacement of 2 miles or more to the South Branch Musquodoboit anticline. There is some doubt, however, about the structure of the rocks on each side of the granitic mass about Tenmile lake.

(5) Sheet Harbour fault, running from a point southeast of Beaver Harbour northwest through Sheet Harbour, and roughly following the course of West River Sheet harbour. It dips to the southwest and gives a left-hand displacement along the strike of 1¼ miles to the Tangier-Harrigan Cove anticline, half a mile to the Mooseland-Gegogan anticline, 1¾ miles to the Moose River-Fifteenmile Stream anticline, and half a mile to the Caribou-Cochrane Hill anticline.

(6) One running from River lake northwest through Mooseland gold district and the abandoned Icelander settlement and giving a left-hand displacement along the strike of a fourth of a mile to the Moose River-Beaver Dam anticline.

To the west of these occur other faults of considerable local importance but not so continuous as the above. The numerous faults of Kings county have a horizontal displacement varying from a few feet to 900 feet.

In addition to the folding and faulting produced in the rocks by the forces to which they were subjected, other phenomena such as brecciation, cleavage, jointing, and fissuring have resulted.

It seems probable that the innumerable quartz veins lying in the stratification planes had their origin in the deposition of quartz in fissures produced by the close folding and the consequent slight slipping of the strata upon one another. The fissures in which such cross-veins as those at Cow Bay, Leipsigate, and Brookfield were deposited, are also probably due to orogenic movements, and like those in which the interbedded veins were deposited, are quite local. In some cases, as at Leipsigate, the fracture strikes in a direction differing little from that of the strata, but dips towards the centre of the dome. Some cross-veins like those at Central Rawdon and West Gore lie in fault planes, and it is not always possible to determine whether a break is a simple fissure or a fault.

The jointing of the series appears to be affected by local structure. In general the joints in the beds of quartzite run in directions at right angles to the axis of the anticline.

Cleavage has been well developed throughout the field and is much more marked in the slate than in the quartzite. The planes of cleavage are parallel with the general strike of the rocks, and are highly inclined, but are in many cases several degrees from the vertical. It is a noteworthy fact that in the vicinity of an anticline the planes of cleavage dip towards the centre of the fold. This fact is frequently taken advantage of to locate the anticline when the bedding planes cannot be determined, the planes of cleavage dipping in a direction opposite to those of the strata. In those slate beds carrying corrugated quartz veins the cleavage is frequently found to curve aside on approaching the crest of a crenulation.

Since the cleavage is nearly vertical, the angles formed by the cleavage planes and stratification planes in strata with a high dip are very acute, but in strata with a low dip they approach a right angle. The combined effect of cleavage, jointing, and stratification is to cause the rocks, especially the quartzite, to break into rhombohedral blocks. Since the angle formed by the cleavage planes and stratification planes is dependent on the attitude of the strata it is evident that the acuteness of the rhombohedrons is dependent on the attitude of the strata from which they were derived. The loose blocks, therefore, serve as a clue to the attitude of the strata, from which they are derived.

Owing to the slate of the Goldenville formation being more plastic than the quartzite, the thickness of any particular bed of the former is by no means uniform throughout a fold. At the apex of the anticline it is often much thicker than on the limbs. As folding proceeded there was some sliding of the beds upon one another, pressure at the apex of the folds was somewhat relieved, and the slate was squeezed from the limbs to the apex. The result was a thinning of the slate beds on the limbs and a thickening at the apex of the fold. In some places the pressure was great enough to force all the slate aside and bring the beds of quartzite together.

Estimates of the relative proportion of quartzite and slate in the Goldenville formation are hard to make. Much of the ground is covered with drift, good continuous sections are scarce, and there is probably a great deal of discontinuity in the beds. In some places a continuous succession of quartzite beds with scarcely any slate may be found several hundred feet thick, as at Mount Uniacke. On the other hand there are some places in which the slate is very abundant, as at Moose River, where in several parts of the district trenches show 50 per cent slate. Woodman[1] has estimated that the slate composes 3 per cent or less of the total thickness exposed.

Owing to the high tilting of the beds and the subsequent erosion, geologists have been able to calculate the thickness of the exposed portion of the Gold-bearing series. This series has been found to be of immense thickness. Faribault has estimated the Goldenville formation exposed north of Moose River as 16,000 feet. Of this formation, Woodman says:

> [2]"The two best localities for measurement, in eastern Nova Scotia, are from the Moose River anticline, at its bifurcation a mile west of Moose River mines, north to the contact of the Halifax formation; and from the more northerly of the two branches into which that axis breaks, 5 miles west of Fifteenmile Stream gold district, north to the contact with the Halifax. The former gives 16,730 feet, the latter 17,670 feet as the exposed thickness of the Goldenville. Strike faults are extremely rare in the Meguma series,[3] and small where found. The traverses made for the purpose of estimating thickness were along lines giving numerous outcrops; and no evidence whatever was found, which would warrant belief in either folding or faulting along the lines of measurement."

Work done by Faribault[4] in Kings county in 1908 shows that

> "A detailed section of the slates measured along Black river from the whin rock to the two bands of Whiterock quartzite, and along Elderkin brook from the same quartzites to the highest slates in the syncline, gives a total thickness of about 14,500 feet of strata. Of this thickness, the lower 11,700 feet correspond in character and thickness to the upper or Halifax division of the Gold-bearing series of the Atlantic coast, and the remaining 2,800 feet, from the base of the two bands of quartzite, are probably a sedimentary series not represented along the coast. If we add to this thickness the 16,000 feet of whin rock, that is, of the Goldenville division as exposed at Moose river, we have a total thickness of 30,500 feet for the whole."

W. H. Prest[5] from a series of careful measurements along Sissiboo river estimated the thickness exposed as 28,000 feet, but Bailey expresses the opinion that in view of the many possibilities of error among rocks so highly folded and faulted it seems to him the estimate is too high. So, although geologists differ as to the exact measurement, all are agreed on the extreme thickness of the series.

The above are calculations of the thickness of the exposed portion of the Gold-bearing series, but it is impossible to determine the thickness of the whole series. In no place has the bottom of the Goldenville formation been found, nor is it at all probable that the highest strata found in the synclines represent the youngest beds of the series. Although erosion on the anticlines has been so extensive as to expose strata at Moose river

---

[1] Am. Geol., vol. XXXIV, p. 17.
[2] Am. Geol., vol. XXXIV, p. 16.
[3] The name given by Woodman to the Gold-bearing series.
[4] Geol. Surv., Canada, Sum. Rept. 1908, p. 152.
[5] Geol. Surv., Canada, vol. IX, pt. M, p. 83.

16,000 feet below the top of the Goldenville formation, it is more than probable that extensive erosion has also taken place in the synclines, and it may be that the highest strata now exposed in the syncline were at one time buried under several thousand feet of sediment.

External. No rocks of greater age are found at any place in contact with the Gold-bearing series, so the discussion of external relations must be limited to a treatment of the relation of these rocks to those of more recent age.

The series is intruded by more or less basic rocks taking the form of dykes or sills lying chiefly in the stratification planes. These are limited almost wholly to the western half of the field. The series is also intruded by numerous masses of granite, the later age of which is shown by the marked metamorphism induced in the Gold-bearing series at the contact. The relations of these intrusives to the series are fully described elsewhere.

In the Nictaux-Torbrook basin and the Clementsport and Bear River basin of Annapolis county the Gold-bearing series lies in contact with a series of early Devonian slates and quartzites that are folded so that the strata dip at high angles and strike east and west as do those of the Gold-bearing series. The Devonian rocks have suffered contact metamorphism in the vicinity of the granite to the south, which has an intrusive relation to them. South of New Canaan, Kings county, lies a narrow belt of fossiliferous, highly altered, impure limestones of Silurian age that have also been subjected to the close east and west folding of the adjacent Halifax formation.

In the vicinity of Avon river and eastward to Chedabucto bay the Gold-bearing series and the related granites are concealed on the north by sediments of the Carboniferous system. These consist in part of sandstone, shale, and conglomerate of the Horton series of early Carboniferous age. This series rests unconformably upon the Gold-bearing series and on the granite, from both of which it derived, in part at least, the materials of which it is composed. The Horton series is overlain in part by gypsiferous limestones, shales, and sandstones of the Windsor series. In places, as in the Musquodoboit and Shubenacadie valleys this series extends beyond the Horton series and rests directly on the Gold-bearing series.

AGE

The determination of the age of the Gold-bearing series is a problem that has vexed all investigators who have applied themselves to its solution. The almost total absence of organic forms makes it impossible for the palæontologist to throw much light on the subject; lithological resemblances may be suggestive, but can hardly be regarded as determinative; of the contiguous formations the oldest seems to be Upper Silurian; Nature, therefore, it would appear, has propounded a problem for the solution of which she has given insufficient data.

Certain markings or forms have been discovered from time to time, and have been hailed with delight as organic and as giving some indication of the age of the rocks, but these have in many cases turned out to be nothing more than concretions,[1] or their organic origin has been disputed, and none has been characteristic enough to be of any determining value. Hind in his report on Waverley district in 1869 mentions the discovery of *Palaeotrochus major* and *Palaeotrochus minor*, besides numerous concretionary forms, but these have long since been shown to be inorganic.[2] Certain other nodular bodies and markings discovered in the quartzite by Hind and referred with doubt by Billings to the genus *Eospongia* and to casts of *Orthis*[3] "consist of little oval depressions surrounded by a raised ridge from which radiate a number of raised lines sometimes bifurcating." They vary in size from 1 inch to 6 or 7 inches in diameter, and appeared to Dawson to be fucoids with radiating fronds, for which he proposed the name *Astropolithon*, and the Waverley species *Astropolithon Hindii*, in honour of the discoverer. The same form has been found in other localities, but some doubt has been expressed as to its organic origin. Another supposedly organic form was found by Selwyn "in the grey sandy and flaggy pyritous slates" at the Ovens Bluffs, Lunenburg county, and was referred by Billings to the genus *Eophyton*, a species of plant, but as [4]" none of the specimens exhibit internal structure, this view does not meet with general acceptation, and the theory that they are trails or tracks of marine animals seems to find more favour." Some have questioned the organic origin of these also. Dawson[5] noted that some loose quartzite blocks near the mouth of St. Mary river bore perforations resembling *Scolithus*, and Bailey mentions some forms occurring in the black slate drift near Bridgewater and also on the coast near Heckman island, Lunenburg county, which[6] " bear some resemblance to brachiopods of the genus *Obolella* or *Linnarsonia*, but they are lacking in markings or other distinctive features by which their nature can be definitely ascertained." In 1902 Henry S. Poole, [7]exhibited to the members of the Nova Scotian Institute of Science a slab of slate from the syncline at Greenbank, Point Pleasant park, Halifax, bearing markings which resemble annelid tracks and burrows; this interesting slab is preserved in the provincial museum, Halifax. The above is a summary of the most important discoveries of a possibly organic nature, but, although they influenced the discoverers in naming the series, they can hardly be regarded as having any stratigraphic value.

The series has been referred by different writers at different times to various ages from Precambrian to Lower Silurian. [8]Jackson and Alger marked it on their map (1832) as " Transition Clay Slate," and Gesner[9] (1843) referred it, without giving reasons, to the Cambrian. Dawson on the map accompanying his first edition of Acadian Geology, 1855, indicated this area as "perhaps altered Lower Silurian" strata, and in a supplementary chapter to the same edition he suggests that it may be a continuation of the Primordial zone of Newfoundland, which afforded trilobites of the genus *Paradoxides*. Prof. H. Hind after the discovery of *Palaeotrochus* at Waverley considered the series as occurring near the base of the Lower Silurian system. Selwyn points to their resemblance to the Cambrian and Lingular flag series of North Wales.

---

[1] Weston, T. C.: Trans. Nova Scotian Inst. Sci., vol. VIII, p. 137.
[2] Woodman, J. E.: Bull. Geol. Soc. of Am., vol. 19, p. 102.
[3] Dawson, J. W.: Supplement to Acadian Geology, 1878, p. 82.
[4] Geol. Surv., Canada, Rept. of Prog. 1870–71, p. 269.
[5] Supplement to Acadian Geology, p. 83.
[6] Bailey, L. W.: Geol. Surv., Canada, Ann. Rept., vol. IX, pt. M, p. 46.
[7] Trans. N.S. Inst. Sci., vol. X, p. 453.
[8] Walcott, C. D.: Correlation Papers, U.S. Geol. Surv. Bull., 81, p. 56.
[9] Geol. Soc., London, Proc., vol. 4, 1843, pp. 186–190.

[1] "The lowest members of the series (Cambrian) there consist of a succession of thick-bedded, greenish grey feldspathic grits and sandstones or quartzites, with intercalated slaty bands; and these are conformably overlaid, as the similar beds are in Nova Scotia, by a set of black, earthy and pyritous slates and sandy beds (the Lingula flags)."

Dawson in his supplement to Acadian Geology, edition 1878, says that he believes the series to be "Cambrian or Primordial, a view which Mr. Selwyn and Prof. Hind have also advocated." Walcott[2] says it is probable that the Cambrian system is represented by the Gold-bearing series of Nova Scotia, but that it may be in large part Precambrian, equivalent to the St. John slates of Newfoundland.

Different authors have pointed out the resemblances existing between the Gold-bearing series of Nova Scotia and the Precambrian slates and quartzites of the Avalon peninsula of Newfoundland. The following section in descending order is that given by Murray of the Newfoundland series, which he classes as the Intermediate System, equivalent to the Huronian of Canada:

	Feet
Dark brown or blackish slates,[3] ripple-marked..	2,000
Green, purple, pinkish, or red, fine-textured slates in frequent alternations..	3,300
Slate conglomerate and slate..	1,650
Diorites, quartzites, and jaspery bands..	1,300

In the same report (p. 167) Murray states that the resemblance between this system and the Gold-bearing series of Nova Scotia "is too striking and marked to be overlooked, and the inference is that on further inquiry it will prove to be of the same horizon."

Van Hise[4] says that the Gold-bearing series may be as late as Cambrian, but that there is a strong probability of their being of Precambrian age. In favour of this view is the extreme scarcity of fossils in the quartzites and slates, whereas there is an abundance of fossils in rocks of undoubted Cambrian age in the same region. He points out the marked similarity existing between the Gold-bearing rocks of Nova Scotia and the folded and cleaved slates and quartzites of the Avalon series of Newfoundland. The latter are certainly Algonkian, being overlain unconformably by Cambrian rocks, and there is a strong probability that the lithologically and structurally similar rocks of Nova Scotia were deposited at the same time.

G. F. Matthew[5] holds the view that they are of Lower Huronian age. The Cambrian terrain of southern New Brunswick agrees almost exactly in the succession and aspect of its members with that of the corresponding terrain of Cape Breton, but does not at all agree with the Gold-bearing series of Nova Scotia, neither has a single characteristic Cambrian fossil been found in the last-named series.

---

[1] Selwyn, R. C.: Rept. of Prog. 1870-71, p. 271.
[2] U.S. Geol. Surv., Correlation Papers, 1891, Bull. 81, p. 263.
[3] Geol. Surv. of Newfoundland, p. 145 (Report for 1868).
[4] "Principles of North American Pre-Cambrian Geology"; U.S. Geol. Surv., Sixteenth Ann. Rept., p. 811.
[5] Trans. Royal Soc. Can., Third Series, vol. II, sec. IV, p. 125.

In a recent discussion of the subject Woodman,[1] through a consideration of "(1) unconformities and the composition of younger rocks, (2) structure, and (3) accompanying igneous rocks," arrives at the conclusion that the series is probably Precambrian.

In 1891 Faribault visited Little Ditton gold district of the Eastern Townships of Quebec for the purpose of comparing the Lower Cambrian rocks of that region with those in question in Nova Scotia, and formed the opinion that the two are probably of the same age. The Little Ditton rocks are divisible into two groups—a lower, quartzite group, and an upper, graphitic, ferruginous slate group—as in the eastern province; another noticeable similarity is the occurrence of numerous quartz-veins along the anticlinal axes.[2] Selwyn concurs with Faribault in these views.[3]

It is evident from the above considerations that there is still room for doubt. It seems improbable that sufficient data for the solution of the problem will be obtained, as some have supposed, by a complete systematic survey of the whole Gold-bearing series. A large part of the area in which this series is exposed has been mapped by Faribault and Bailey, and some considerable work has been done in that district lying immediately to the south of the Annapolis-Cornwallis valley where this series is found in contact with rocks that are fossiliferous.

Bailey[4] failed to find any distinct break between the non-fossiliferous slates and quartzites of the series in question, and the associated fossiliferous slates and quartzite of Bear river carrying organic remains, some of which have a decided Lower Devonian or Oriskany aspect, whereas others appear to belong to a somewhat lower horizon.[5]

In a study of that area lying south of a line stretching from Wolfville to Kentville in Kings county, and west as far as the Aylesford road, Faribault has shown that with the exception of the small body of the Niagara series of New Canaan nearly all the rocks are of the Gold-bearing series. The slates are very similar to those of the Gold-bearing series in other parts of the province, and the quartzite which is exposed along some of the anticlines is the same as the whin of the Goldenville formation. These rocks have been subjected to the same close folding, and the main anticline was traced southwest to the granite. The most westerly of these folds extends southwest from Kentville, plunging to the east and bringing up the Goldenville formation in a broad zone extending from Tupper lake to the granite. All the rocks of this region have also suffered from the same northwest and southeast faulting as the series in other parts of the province. Careful work in this part of the field failed to reveal any unconformity between the slates of this Gold-bearing series and the fawn slates near

---

[1] Bull. Geol. Soc. Am., vol. 19, p. 99.
[2] Geol. Surv., Canada, Sum. Rept. 1891, p. 55.
[3] Geol. Surv., Canada, Sum. Rept. 1891, p. 55.
[4] Geol. Surv., Canada, Ann. Rept., vol. IX, pt. M, p. 83.
[5] Geol. Surv., Canada, Ann. Rept., vol. IX, pt. M, p. 115.

Kentville in which *Dictyonema Websteri* was found. Owing to the great amount of drift encountered, however, the possibility of an unconformity or of a disconformity was not wholly eliminated.

Thus the problem still remains to be solved. Although the term Cambrian has been provisionally applied for a number of years to the series, the tendency at present is to regard it as Precambrian.

Lower Carboniferous

Small patches of sediments of this age are scattered along the coast at St. Margaret bay and Mahone bay. They consist of beds of limestone, sandstone, and shale lying unconformably on the Gold-bearing series and the granite. Shell limestone was observed on Goat, Sheep, and Stephen islands, and on Second peninsula, and gypsum on the southwest shore of Goat island. Numerous funnel-shaped sink-holes as much as 50 feet in diameter and 20 feet deep, are found in the drift and may have had their origin in the solution of underlying deposits of gypsum. In some places, as at Indian point, the limestone was quarried for lime a number of years ago. At Chester Basin some small deposits of mineral pigments found resting on the limestone once received some attention.

Basic Intrusives

Intrusions of a basic nature taking the form of dykes and sills cut the Gold-bearing series, but they are limited in their distribution almost wholly to the western part of the fields. In Tangier gold district east of Halifax a dyke 40 feet wide cuts the strata at right angles, and there is a small one on Devil island at the mouth of Halifax harbour. In the Gold-bearing rocks of Kings county such intrusions are very numerous, and vary in thickness from a few inches to 100 feet or more. They nearly all lie in the bedding planes of highly inclined strata, and have altered the slate for a few inches on each side.

The most striking of these basic dykes is one that cuts the Gold-bearing series and granite of the southern part of Queens and Shelburne counties. It is 200 to 600 feet wide and extends from an island off the mouth of Lahave river on to the mainland and to Roseway river, a distance of 60 miles.

All these igneous rocks have received the field name diorite. Those of Kings county are dark-greenish and crystalline and seem to have undergone much alteration. They have a strong argillaceous odour and many are noticeably schistose. A microscopic examination of some of the less altered shows that they are fairly fine-grained, holocrystalline, hypidiomorphic rocks with an ophitic texture. There seems to be a large development of hornblende crystals cut by laths of feldspar. They are probably much altered diabase.

Little seems to be known regarding the age of these intrusions, but that they are of remote age seems probable from the great degree of alteration they have undergone. Those of Kings county are affected by the northwest and southeast faults crossing the Gold-bearing series.

Granite

DISTRIBUTION

Granite is widely distributed throughout the gold fields. It consists of masses varying greatly in size. Most of those east of Halifax do not exceed 10 miles in width or 40 miles in length, but they are very numerous, especially at the eastern end of Guysborough county. To the west of Halifax lies a crescent-shaped mass 95 miles long and 20 miles wide. It extends westward into Yarmouth and Digby counties, and northward nearly to Cornwallis-Annapolis valley, the concave part of the crescent facing south. In addition to this, other and smaller masses occur in Queens, Shelburne, and Yarmouth counties.

LITHOLOGICAL CHARACTERS

The composition and texture of the granite vary much. Sir William Dawson in his "Acadian Geology" describes it as sometimes porphyritic and composed of white or smoky quartz, of white or—more rarely—flesh-coloured feldspar, and grey or black mica. Dr. D. Honeyman says that it is generally coarse and composed of white orthoclase, hyaline to smoky quartz, and black or grey mica.[1] He also states that the rock is largely porphyritic. Faribault, in his report on the eastern counties, says that the granite varies much in texture and composition according to the position. It is composed of white or pink feldspar, white, colourless, or smoky quartz, and white mica forming a uniform fine-grained mass, that becomes porphyritic towards the centre and carries phenocrysts half an inch to an inch and a half long.[2] The same writer describes the granite west of Halifax as generally coarse and porphyritic, but often finely crystalline.

Gesner as early as 1849 suggested that the granite is of at least two different ages, for he mentions that some he examined contained masses of older granite which are readily distinguished by a difference of colour.[3] Woodman is also of the opinion that the granites are not all of the same age.[4]

W. J. Wright[5] describes two types of granite in New Ross area, a muscovite granite and an older biotite granite. The latter is a porphyritic rock with phenocrysts of microcline in a medium-grained groundmass composed of plagioclase, orthoclase, quartz, and biotite. Aplitic phases are common throughout the mass in the form of dykes and bosses. The muscovite granite is a coarse-grained porphyritic rock with phenocrysts of orthoclase in a groundmass of orthoclase, plagioclase, quartz, biotite, and muscovite. Aplite phases are found in the form of dykes and as large masses grading into the typical granite. The aplite is usually accompanied by a great amount of pegmatite which occurs as masses varying greatly in size. Most of the prospects for tin and the associated minerals are in these pegmatites. The muscovite granite is intruded into the biotite granite, but judging from the mineral composition and the nature of the contact of the two, it is possible that they are closely related in origin and age, and that in other areas one may grade into the other.

---

[1] Honeyman, D.: Nova Scotian Geol.—Halifax and Colchester counties. Trans. N.S. Inst. Sci., vol. VI, p. 53.
[2] Faribault, E. R.: Geol. Surv., Canada, Ann. Rept., vol. II, pt. P, p. 132.
[3] Gesner, A. "Industrial Resources of Nova Scotia", 1849.
[4] Woodman, J. E.: Am. Geol., vol. XXXIII, July, 1904.
[5] Geol. Surv., Canada, Sum. Rept. 1912, pp. 384-387.

The Gold-bearing series adjacent to the granite is cut by numerous dykes that vary greatly in composition and texture; they grade from the regular biotite granite through pegmatites devoid of the ferromagnesian minerals to veins of pure quartz,[1] the three varieties being found sometimes in one and the same tongue. These dykes generally follow the bedding planes of the intruded rocks, but in many cases cut across them. Good examples of the coarse-grained dykes are to be seen in Guysborough county, crossing the Whitehaven road a quarter of a mile south of its junction with the Canso road. The north fork of a mass of granite extending west from Country Harbour river a little below Fenton brook narrows into a pegmatitic dyke 40 yards wide; in this the quartz and feldspar often exceed the size of a man's head and some mica scales are found over 6 inches in diameter. Dykes passing into quartz veins are to be seen crossing the Whitehaven road, Guysborough, and at Cochrane Hill narrow intrusions are numerous, which frequently are very fine-grained, carry little mica, and pass into what has been described as quartz-felsite.[2]

AGE

Evidence points to the granitic intrusion having taken place during the Devonian period. The early Devonian formation of the Nictaux-Torbrook area was undoubtedly affected by the intrusion and the granite must have been unroofed prior to the deposition of the Horton series of Lower Carboniferous age, as sandstone of this series rests in places directly on the granite.

Metamorphic Rocks

DISTRIBUTION

Crystalline schists and gneisses are found rather widely distributed throughout the gold fields, but are of limited area. They usually occur in a more or less continuous zone surrounding the granite masses, but they are also found in zones or irregular patches several miles distant from any present outcropping of granite. Good exposures of the metamorphic rock at or near the granite contact can be seen at Cochrane Hill, Guysborough county, on the Canadian National railway a few miles west of Halifax, along the Dominion Atlantic railway west of Uniacke lake, on Port Joli harbour, and numerous other places. Exposures of metamorphic rock more remote from contact occur at the extreme ends of the field. At Whitehaven,[3] Guysborough county, between Marshall cove and Wash brook, are two zones a fourth of a mile wide extending to the southwest in the same direction as the folding and appearing to lie in two synclinal troughs. They occur also on the west side of Port Latour harbour, on the west side of Pubnico harbour, and in and about Yarmouth city and harbour.

---

[1] Faribault, E. R.: Geol. Surv., Canada, Ann. Rept., vol. II, pt. P.
[2] Faribault, E. R.: Geol. Surv., Canada, Ann. Rept., vol. II, pt. P.
[3] Geol. Surv., Canada, Ann. Rept., vol. II, pt. P, p. 143.

LITHOLOGICAL CHARACTERS

The rocks consist of gneisses and schists of various kinds. The gneisses are foliated, consist chiefly of quartz and mica, and are usually lacking in feldspar. The schists are micaceous, and in some of them there is a marked development of staurolite or andalusite crystals, or both. The gneiss associated with beds of mica schist is sometimes found to[1]

> "graduate upwards into a series of beds which, while more slaty, have usually an aspect of much greater coarseness and roughness. This appearance is almost wholly due to the development in the beds of vast numbers of staurolite crystals asociated not unfrequently with crystals of andalusite and less commonly of garnet. The staurolite crystals are often quite perfect and usually easily separable from the mass of the rock. The andalusites, on the other hand, are but imperfectly formed, not separated from the matrix, and like the latter, often studded with prismatic hexagonal scales of black mica. The garnets, though well formed and clear, are generally minute."

Occasionally twin crystals of staurolite occur. The andalusite crystals, which often occur in stellar groups, are pearly, often pale pink, slender, and prismatic, sometimes 2 or 3 inches long. A great deal of white mica enters into the composition of some of the schists, giving the rock a whitish, somewhat pearly appearance; throughout it are innumerable small knots almost black in colour, but without any crystalline form distiguishable in the hand specimen.

In addition to these are rocks that have not undergone so great a degree of alteration, and that are more of the nature of phyllites. Some of these are nearly black in colour, and have a wavy cleavage with a silky lustre. Scattered through these are a great many small black dots that probably represent incipient crystallization.

Some of these metamorphic rocks are highly charged with pyrite.

Faribault describes the rocks at Whitehaven as glistening, pearly, and full of stout, short crystals of andalusite. On McNutt[2] island the quartzites are overlain by, and graduate into, mica-schists studded with staurolite and andalusite. Some layers are filled with sheafs of hornblende. At Crowneck point, south of Upper Port Latour settlement, are schists studded with crystals and "semi-crystalline nodules of andalusite," many of which are themselves studded with staurolite, and the weathered surface has the appearance of a coarse conglomerate. Some portions of the rock are a true conglomerate. Some parts also are spotted with dark green blotches with no very definite outline. At[3] the head of Pubnico harbour some andalusite schists are found to enclose numerous well-defined pebbles, mostly of quartzite, so that the original rock was a conglomerate.

The altered rocks about the town of Yarmouth were described by Dawson in "Acadian Geology," and later and in greater detail by Selwyn in the Geological Survey Report of Progress 1870-71, p. 271. Bailey says,

> "the belt, having a width of about 7 miles and a length of about 40 miles, may be described as consisting of highly metamorphosed strata in which the abundance of mica, and especially of hornblende, are the most characteristic features. Chlorite and epidote also characterize some of the beds, but are much less conspicuous, and in some instances the strata are either feldspathic or quartzose."

---

[1] Geol. Surv., Canada, Ann. Rept., vol. IX, pt. M, p. 64.
[2] Geol. Surv., Canada, Ann. Rept., vol. IX, pt. M, p. 57.
[3] Geol. Surv., Canada, Ann. Rept., vol. IX, pt. M, p. 68.

Good exposures are seen about cape Fourchu and a belt of garnetiferous schist is well exposed over a width of 36 feet at Chegoggin point. Some

> "highly micaceous strata (which also contain numerous scattered sheafs of hornblende and are in part true hornblende schists), are also to a large extent conglomerates, being filled with numerous pebbles, sometimes as much as a foot in diameter."

These pebbles consist of quartzite in some beds and in others of a grey or purplish-grey, vesicular rock, and are flattened and elongated in the direction of the cleavage.

These altered rocks can be traced northeast from Yarmouth past Hebron, Wellington, and Ohio. Similar beds occur in the vicinity of lake George and about Little and Great Brazil lakes and lake Annis, but here the hornblende is not so well developed, and staurolite and garnet crystals are abundant.

MODE OF ORIGIN

It seems certain that the metamorphism in the zones of altered sediments surrounding the granite intrusives was induced by contact action of the granite magma. The rocks are most highly altered near the granite, and gradually merge with distance into unaltered slate and quartzite. Lithological resemblances indicate that alteration of at least some of the sediments now lying at a considerable distance from present exposures of granite was brought about by similar agencies and may be due to contact action of granite masses lying at no great depth but not yet exposed by erosion.

Pleistocene

It has been pointed out that the gold fields were subjected to glaciation, and that a great deal of rock was laid bare by glacial erosion. Deposition also took place, but to greater extent in the west than in the east, and boulder clay, sand, and gravel, moraines, drumlins, and kames are common. For a full discussion of glaciation and glacial deposits the reader is referred to Geological Survey Memoir 140, "Physiography of Nova Scotia," by J. W. Goldthwait.

Post-Glacial

Since Glacial times the surface has been subjected to subaerial erosion, and the unconsolidated surface deposits have suffered some rearrangement with a little deposition in the valleys and on the submarine continental shelf. The small amount of loose material left by the glaciers has, however, been well protected by the forest growth, and although in recent years the forests are being cut down, so little of the region is arable that the vegetable mantle is seldom completely removed. Peat bogs have formed or are in process of formation in various parts of the province, and infusorial earth in some of the lakes. The meadows, low-lying stretches found along some of the streams, covered by water during a part of the year and producing a rich growth of grass, probably have their origin in the redistribution of glacial drift. The sand dunes of the west are post-Glacial, and the salt marshes, mud flats, spits, bars, hooks, and loops so common between Jeddore and Halifax are formed by the resorting and redistribution of loose surface material in recent times.

Another feature of interest is the formation of ridges of gravel and boulders about the shores of the lakes. These are in some cases 3 or 4 feet high, and are formed by ice expansion during the winter. The ice along the shore freezes fast to the loose rock, and as it shoves upon the shore, it carries with it the pebbles and boulders, and deposits them. Some of the larger boulders in being pushed shoreward were used by the ice mass to cut quite noticeable channels in the debris, and such channels 10 feet in length are quite common.

HISTORICAL GEOLOGY

An attempt may be made to construct a history of the events that have affected the gold fields.

There was a deposition of terrigeneous matter on a sea-bottom that continued a slow subsidence until sediments were accumulated to a thickness of between 5 and 6 miles. The sediments laid down during the first half of the great period of deposition consisted chiefly of sands with occasional interruptions of fine material such as mud and clay, and a very subordinate amount of gravel. These are the sediments of the Goldenville formation. The second half of the period was one of great deposition of clay, the Halifax formation.

The variation in the degree of fineness of the sediments of the Goldenville formation may be due to a combination of causes. The following suggest themselves.

(1) Long periods of abundant or ordinary precipitation alternating with shorter periods of drouth.

(2) A change in the direction or velocity of the shore currents owing to change in the configuration of the coast, climatic changes, or other causes.

(3) Variation in the rate of subsidence.

Following the deposition of the Goldenville sediments was a short period during which a portion of the waters was comparatively clear, permitting the deposition of a very small amount of calcium and magnesium carbonate. Whether this deposit represents the accumulated secretions of low organisms or chemical precipitation is not known. The clearness of the waters may be due to a change in currents or to reduced precipitation for a short time.

Then came a long period during which the fine sediments of the Halifax formation were laid down. During a portion of this time the waters probably swarmed with organisms of a low type, but the conditions were not favourable to the development of lime-secreting forms.

The location of the early continent is much a matter of conjecture. There are a few facts that point to its location to the southwest of the present peninsula: (1) the conglomerates occur chiefly in the southwest; (2) crossbedding is more common in the southwest, both in the quartzite and in the more siliceous beds in the slate; (3) the slates in that part are less uniform, and assume greater variety.

There is little evidence of what occurred between the period of deposition and Devonian times. The absence even in the great synclines of any overlying rock of earlier age than the late Silurian indicates an epeirogenic movement, which brought the area above the level of sedimentation. Then came the subsidence of at least a small area that received the Silurian and Devonian sediments of Kings and Annapolis counties. The extent of rock folding before early Devonian times was probably slight, because rocks of this age appear nearly or quite conformable with those of the Gold-bearing series, and seem to have suffered the same close folding and faulting. On the other hand the Horton series rests unconformably on the much folded Gold-bearing series, and we, therefore, conclude that the latter series was, during Devonian times, subjected to forces that produced great orogenic movements.

There were two main forces of compression that effected the mountain building, the greater producing the long east and west folds, and the less, which was probably contemporaneous with the other, producing the plunging of the anticlines and the formation of the domes. This period of orogenic movement was an important one in the history of the Gold-bearing series, the period in which it acquired its economic value. Numberless fissures were opened along the bedding planes, or across the bedding, or in other cases alternately along and across the bedding, and the rocks were fractured permitting the passage of solutions into the fissures. From these solutions, which probably came from depth, auriferous quartz was deposited.

Following the formation of the veins came a time of faulting during which local faults were formed in the domes and long cross-country faults cutting across the main folds in a northwest and southeast direction.

As soon as the rocks were brought by the orogenic movement within the sphere of atmospheric activities denudation began, and the height to which the mountains rose depends not only on the forces that produced the folding, but also on the intensity of the erosion. It is certain that the levelling of the hills had reached an advanced stage before the formation of the Horton series.

In Devonian times came a period of extensive igneous activity, during which the batholiths of granite were formed and the marked metamorphism of the intruded rocks effected. No trace of a volcanic phase of this activity has been discovered in the gold fields.

At some time in the history of these rocks, dykes and sills of basic igneous intrusions were formed in the west, the most of which lie along the bedding planes. The age of these has not been determined, but they were formed prior to the production of the great northwest and southeast system of faulting, to which the Gold-bearing series was subjected.

After the granite intrusion, the sediments of the Horton series and the Lower Carboniferous limestones, shales, and sandstones were deposited. Subsequently came a certain amount of elevation with erosion, resulting in peneplanation, then another elevation with rejuvenation of the rivers, and finally the incision of the river valleys of the present day.

In Quaternary times there was a period of glaciation during which the unconsolidated surface material was much disturbed and a large proportion of it carried to the sea. The rocks were well exposed and the auriferous quartz veins uncovered.

CHAPTER IV

PRIMARY GOLD DEPOSITS OF THE MAINLAND

INTRODUCTION

The gold deposits are the only ore deposits of the area that are of any considerable economic importance. These nearly all occur in veins, but a small amount of gold has been recovered from detritus. The deposits at West Gore consist of an auriferous antimony ore and have been worked considerably for their antimony as well as their gold content. A vein of manganese ore consisting of pyrolusite and manganite and occurring in the granite a few miles north of New Ross, Lunenburg county, was worked a number of years ago, and another was more recently discovered in the vicinity. Near Lake Ramsay, also in the vicinity of New Ross, a small amount of cassiterite has been found, associated with fluorine-bearing and lithium-bearing minerals. Galena occurs near Musquodoboit harbour, Halifax county, and scheelite at Moose River and at Waverley. A few other minerals have been reported and some have been mined more or less. Granite has been quarried in different localities, and slate has been worked to a small extent.

The gold deposits are divisible, according to their origin, into two classes, primary and secondary, and will be treated under these headings. The primary deposits of Cape Breton island are distributed through rocks that, though of Precambrian age, are quite different from those in which the deposits of the mainland are found, and will require separate treatment.

GENERAL CHARACTER AND DISTRIBUTION

Gold-bearing quartz has been reported as occurring in the granite, but little development has been carried on. It has been reported west of Halifax at Sambro, at Ketch harbour, Pennant harbour, Torrance bay, and Hubley lake.

[1]"On the East river, St. Margaret bay, a fourth of a mile below Hubley lake where the Halifax and Southwestern railway crosses the river, a pit was sunk to a depth of 50 feet in the early days of gold discoveries in Nova Scotia on a quartz vein running north and south. It included pyrites and possibly galena, and was supposed to contain gold. A ten-stamp mill was built, but, so far as could be ascertained, not a trace of gold was recovered."

Apart from the doubtful occurrence of quartz veins in the granite, nearly all the primary deposits of gold of the mainland are to be found in the Gold-bearing series. Although there are a few important veins that cut across the bedding, most of the auriferous quartz veins are of the interbedded type, that is they are conformable with the layers of the sedimentary rocks in which they occur. As has already been pointed out, they occur chiefly in the beds of slate that are found interstratified with the quartzite of the Goldenville formation, and their distribution and their structure are to a great extent the result of dynamic forces to which the enclosing rocks were subjected. The grouping of the veins in great numbers on domes or on the plunge of the anticlines, the crescentic shape of the exposures, the laminated character of many, and the abundance of feeders are all more or less due to the close folding of the rocks.

---

[1] Faribault, E. R.: Geol. Surv., Canada, Sum. Rept. 1906, p. 148.

It is clear that the auriferous veins are not limited to any particular horizon, but are found at various depth throughout the Goldenville formation, where structural conditions were favourable for the deposition of ore. There is only one horizon that can be traced throughout the series with certainty and that is the boundary between the two formations, and the horizons of the auriferous strata are always referred to this datum plane.

The depths of auriferous veins below this plane for the districts east of Halifax are as follows:

		Miles
“Moose River	about	3¼
Tangier	“	2¾
Fifteenmile Stream and Beaver Dam		2½
Lawrencetown		2
Goldenville, Harrigan Cove, Gold Lake, and Forest Hill		1½
Waverley and Renfrew		1¼
Mooseland, Killag, Liscomb Mill, Richardson, Lower Isaac Harbour, Wine Harbour, and Montague		1
Ecum Secum, Middle Isaac Harbour, Cochrane Hill, Lake Catcha, and Oldham		¾
Salmon River		½

Caribou at the base of the Slate Group. Stewiacke about three-fourths of a mile above the base of the Slate Group.”

The above table shows that auriferous veins may be looked for anywhere throughout the whole thickness of the Goldenville formation, the essential feature being not the location of any particular horizon, but rather the discovery of domes and plunging anticlines giving the favourable structural conditions. The slate beds themselves are not strictly essential, and veins are frequently found, as at Mount Uniacke, between beds of quartzite.

A few paying veins have been found in the Halifax formation, but these are the exception.

There are not nearly as many gold districts in the western half of the field as in the eastern, and few have proved as productive as those of the east. The Goldenville formation is not so well exposed, and the folding was so gentle that there were fewer channels and openings on the anticlines to permit of the transmission of solutions and the deposition of vein matter.

MINERALOGY

The gangue of the auriferous veins consists chiefly of quartz with calcite and sulphides in subordinate amounts. There are two varieties of quartz, one being white, crystalline, and frequently coarse, the other dark or smoky, in some cases blue, or blackish, generally laminated, and of an oily lustre. The calcite is in some cases magnesian and ferruginous. Among the metallic minerals, pyrite and arsenopyrite are much the commonest, but galena, chalcopyrite, sphalerite, and pyrrhotite also occur. Amongst the sulphides must also be mentioned the auriferous stibnite of West Gore, mined as an antimony ore. Hunt reports that molybdenite and stibnite are said to have been observed in some localities, and that, at Country Harbour narrows, auriferous quartz near a granite intrusion carries small garnets and zircons. A prismatic and massive form of black rutile[1]—possibly referable to nigrine or ilmeno-rutile—has been identified from the Irving lead at Mooseland. Poole[2] mentions "felsite," mica, and chlorite. Scales of mica are found in some of the leads at Forest Hill, Cochrane Hill, and Crows Nest. These[3] veins usually follow the cleavage planes and cut the interbedded leads. Quartz mined from one of these at Crows Nest is reported to have yielded some gold. At Lower Seal Harbour[4] feldspar is found in some portions of the veins.

Quartz, with hardly an exception, forms by far the largest proportion of the vein filling, but occasionally calcite or one of the sulphides is quite abundant. Sometimes druses are found, which bear crystals of quartz or calcite. At Hammond Plains beds of feebly auriferous quartz as much as 20 feet thick have numerous cavities lined with crystals of calcite, the surfaces of which are themselves spangled with cubes of pyrites.[5] "At Renfrew, where the strata have evidently slid over one another, crystals of calcareous spar are common, and sometimes form as much of the lead as the rich gold-bearing quartz itself."

Woodman's observations at Moose River go to show that the distribution of the pyrite, which occurs in cubes and granular masses, is quite irregular. It occupies no definite central position, but it is found most commonly on the margins of the veins in sheets and most abundantly on the hanging-wall,. In some places it protrudes from the wall-rock into the quartz. Arsenopyrite in the veins is erratic in distribution and is massive, except in a few instances. Silliman noticed that at Tangier there was a tendency on the part of the sulphides, perhaps in a majority of cases, to segregate on the foot-wall. Rarely, pyrite or arsenopyrite forms the complete vein filling; examples of this are the Anderson Mundic lead of Goldenville and another lead 4 or 5 feet thick on Cobourg area of the same district, composed almost wholly of arsenopyrite. Galena, which is generally very subordinate in amount, is irregularly distributed, although at Moose River it occupies the interior of the lead in both quartz and calcite. Chalcopyrite is distributed sparingly through some of the veins in an irregular manner.

Silver is found in the gold recovered from the Micmac vein of Leipsigate and the Libbey vein of Brookfield, in some cases in such amounts as to reduce the value of the product to $16 an ounce; the gold from interbedded veins runs from $19 to $20 per ounce.

---

[1] Geol. Surv., Canada, vol. XI, pt. R, p. 16.
[2] Quart. Jour. Geol. Soc., London, vol. 36, p. 309.
[3] Faribault, E. R.: Geol. Surv., Canada, Ann. Rept., vol. XV, pt. A, p. 413
[4] McKenzie, T. G.: Trans. Min. Soc. N.S., vol. XII, p. 67.
[5] Hind, H. Y.: "Report on the Waverley Gold District", 1869, p. 25.

The fineness of the gold is shown by the following table of analyses made many years ago:

Locality	Authority	Composition				
		Gold	Silver	Copper	Zinc	Total
Mooseland	O. C. Marsh	98·13	1·76	0·05	....	99·94
Tangier Field lode	B. Silliman	97·25	2·75	....	....	100·00
Tangier-Leary lode	U.S. Assay Office	96·60	....	....	....	
Waverley	H. How	94·69	4·74	0·39	0·16	99·98
Ovens	A. Gesner	93·06	6·60	0·09	....	99·75

The gold occurs not only free and visible and amenable to amalgamation, but also intimately bound up with the sulphides and requiring other methods of treatment for its recovery. In the white, coarsely crystalline quartz it is found in coarse, visible particles showing a tendency towards crystallization; whereas in the bluish, oily quartz of the laminated veins, the structure of which will be described later, it is usually disseminated more finely through the quartz or is found in plates in a single layer in the middle, or in several layers parallel to the walls or on the margins of the veins. It is generally most abundant on the foot-wall. Crystals[1] of gold have been found. From Tangier has been obtained a rhombic dodecahedron a third of an inch in diameter with bevelled edges and bright, finely striated faces; distorted octahedra have also been found with dull, rounded faces. A large number of crystals were found at the outcropping of the McDonald lead on the Archibald property at Harrigan Cove, and a few were purchased for the National Museum of Canada. Gold is very commonly associated with arsenopyrite and almost invariably with galena, often forming large nuggets. At the surface the weathering of the sulphides has in many cases left a porous, rusty mass with free gold taking the form of plates, wires, and nuggets. Plates and scales are often found in the adjacent slate, so that the whole belt is sometimes crushed. On close examination this gold occurring in the slate is found generally to be associated with small films of quartz.

CHARACTER OF DEPOSITS AND RELATIONS TO COUNTRY ROCK

Interbedded Veins. As has already been pointed out, the auriferous veins are found on the domes, although in some few cases, as at Upper Seal Harbour, they are found on the plunging parts of anticlines remote from domes. The distribution of the veins on any particular dome is intimately related to the rock structure, and complexity is introduced by lack of symmetry. The main axial plane may be inclined from the vertical, the plunge in the two different directions may be widely different, the axis may be curved, subordinate folds may be developed on the limbs parallel with the main fold or radiating from the centre of the dome, or complexity may result from the union of two anticlines.

---

[1] Marsh, O. C.: Am. Jour. Sci., 2nd series, vol. XXXII, p. 397.

[2] Gilpin, E.: Trans. North of England, Inst. Min. Eng., vol. 31, p. 169.

On sharp,[1] closely folded anticlines, where the planes of bedding on one limb form an angle of less than 40 degrees or 45 degrees with those on the other, the veins are found close to the apex and generally curve over the anticline forming a succession of saddles. On broad folds, on the other hand, where the angle formed by the two limbs is over 45 degrees, the veins are found at a greater distance from the axis. As a general rule the veins are most abundant and richest within the limit of curvature of the strata of the fold. At the apex of a fold the strata are horizontal and the dip increases with distance from the apex until it finally becomes uniform, usually at a high angle. It is within this area of increasing dip, that is within the area of curvature of the strata, that the veins are found.

In a symmetrical dome like that of Oldham the outcrops of the veins form almost complete ellipses. On the sides of long domes they run for some distance in nearly straight lines, but they finally curve towards the apex of the fold and in some cases are traceable continuously into the opposite limb. The identification of a vein on one limb with the corresponding vein on the other limb is so difficult as to be certain only when one has been definitely traced into the other. Domes are rarely symmetrical, and there are many districts in which veins are found only at one end or on one side of the dome. In some districts the formation of veins seems to have been dependent on a subordinate flexure on the limb of a fold, producing a curve of shorter radius in the strata than that produced by the main fold. The subordinate folds radiating southward from the dome at Mount Uniacke and southwestward from the dome at Renfrew furnish good examples of this. In some places, as at Mooseland, there is a curving of the main axis of the fold, and in such cases veins (especially those that are auriferous) are found to be much more numerous on the convex side of the axis.

Mining operations have shown that underlying the veins exposed at the surface are other parallel interbedded veins. Each district has thus a vein-bearing zone with a horizontal extent determined by the outcropping veins and with an indefinite vertical extent. In its vertical extension it is believed to be roughly parallel with the axial plane of the anticline. The distance of the exposed veins from the axis depends on the dip of the strata, and it is probable that the distance from the axis of any portion of the zone of veins extending into the earth is also dependent on the dip; if the fold gets sharper with depth, the zone of quartz veins probably approaches the axial plane, or if it flattens with depth as at Salmon river, the zone of auriferous veins recedes from the axial plane.

Most of the veins lie in slate beds a few feet wide. Rarely they lie in the middle of the bed, and as a rule only when the bedding is marked by some difference in composition or texture, producing planes along which fracturing took place. By far the greater number lie on the quartzite foot-wall with only a thin film of crushed slate or gouge separating them from the quartzite. Occasionally, as in the Sterling lead at Oldham, the quartz is "frozen" to the wall. As a rule the veins are quite conformable with the strata, but occasionally they pass from one wall to the other. A saddle-vein, as in the case of the Richardson, may have one leg on the foot-wall and the other on the hanging-wall. If a small crumple occurs on the limb of an anticline the vein may lie on the foot-wall in that part above the crumple and on the hanging-wall in that part below, and take the form of irregularly-shaped veinlets and quartz masses scattered all through the slate belt where it passes from one to the other in the short limb of the crumple. The West Lake is a good example of this. Some veins bifurcate, and one part passes to the hanging-wall, whereas the other remains on the foot-wall.

---

[1] Faribault, E. R.: "Gold Measures of N.S. and Deep Mining", p. 13.

Some slate beds are found to carry several quartz veins, generally conformable with the strata. These veins are in many cases so small that they could not be profitably separated from the slate, and more or less of the whole body of slate and quartz is milled. These beds of slate with numerous small veins are designated belts, and the well-defined vein is designated a lode or lead. The belt is in many cases 10 or 20 feet wide, and furnishes large bodies of low-grade ore. It is sometimes composed of a network of quartz, the veinlets following the bedding planes for short distances and then crossing to join other veinlets. There is a strong tendency towards a thickening where they cross the bedding.

A great many of the interstratified veins exhibit a folded or corrugated structure. The corrugations, usually seen at or near the apex of the anticline and sometimes in the syncline, run parallel with one another and in a direction approximately parallel with the anticlinal axis. Where the axis is horizontal the corrugations are nearly horizontal, but where the axis of the dome plunges the corrugations dip in about the same direction and at about the same angles as the plunge of the axis. On the nose of the fold the corrugations dip with the dip of the strata, but on each side of the nose radiate more or less from the centre of the dome.

The peculiar corrugated structure of a vein on the apex of the plunging anticline at Waverley attracted attention in the early days of gold mining in the province, and from its resemblance to a series of casks laid end to end and side by side, the name "barrel" quartz was given. This term is still much in vogue, and is applied to the larger series of corrugations.

The slate beds adjacent to the corrugated veins show a sympathetic folding which extends from a few inches to a foot or two from the vein and gradually dies out. Very rarely is the influence felt in the whin beds, and then only in connexion with the large corrugations on the apex of an anticline.

When some part of a vein becomes enlarged or takes on some peculiarity of form, structure, or mineral content that is traceable for some distance in one direction, or when one of the corrugations becomes enlarged so as to have an individuality of its own, this portion of the vein is called a roll. A roll is frequently richer than other parts of the vein. Its position is usually dependent on some peculiarity of rock structure such as some subordinate crumple, some slight flexure in the beds indicating an incipient crumpling, or some zone of fracturing. As crumples, flexures, and fracture zones usually affect a great thickness of strata a number of veins are affected by similar conditions, and a roll on one vein is succeeded by similar rolls on the underlying or overlying veins.

Many of the interbedded veins exhibit a more or less laminated structure through the whole or a part of their length and thickness, and consist of bluish quartz with an oily lustre enclosing several thin films of slate parallel to the wall of the vein. The laminated parts of the veins are usually auriferous. In some veins, as the Barton lead at Tangier, fragments of slate are found embedded in the quartz with trails of smaller pieces leading to that part of the wall from which the enclosed slate was loosened.

The thickness of the veins that lie in the planes of stratification varies from a fraction of an inch to 24 inches. The greater number may not be much over an inch, but those that have been worked average several inches. An 8-inch vein is regarded as of good size. There are some, of course, that exceed these figures and are as much as 20 feet. Many are traceable horizontally for a thousand feet or more with little variation in thickness.

The largest veins are usually found on sharp anticlines. Saddle veins attain their maximum thickness on the apex of the fold and become thinner as they extend downward on the limbs. Thus the Richardson vein although 20 feet thick at the apex thinned to 6 feet at the 300-foot level. Some leads have been followed to a depth of several hundred feet with little or no decrease in size, but others have been found to pinch to a mere film of quartz, and it is probable that nearly all of them pinch out at no great depth. The Dominion lead at Waverley was found to decrease from 15 inches on the surface to a mere film of quartz with small lenticular pockets at 500 feet, and to be completely wanting at 600 feet.

Veins are frequently thickened by local disturbances such as a bend, a crumple, or a faulting of the strata. There is also a thickening in that part lying below the line at which an angular enters from above and extending downward to the line from which the angular is given off below. At the top of saddle veins in some districts where the strata are closely folded, the quartz in some cases extends upwards in a large mass where the strata are parted and forms what is known as a rider. A good example is that at the Dufferin mine, Salmon river, where a rider 20 feet thick was worked. In other cases the overlying and underlying rock is much fractured, and the quartz extends from the saddle vein into the fractures, forming a reticulated system of veins.

The workable belts furnishing many of the bodies of low-grade ore are usually over 2 or 3 feet in width, and are often much more than this, the well-known Palmerston belt of Goldenville being 22 feet.

Although leads show a great similarity and are very numerous, some fifty-five different ones being worked or exposed in a width of 1,200 feet on the north side of the dome at Goldenville, and fifty in a width of 500 feet on the south side, yet many of them possess a certain individuality, some peculiarity of colour, structure, lamination, distribution of sulphides, quantity or form of gold, serving to distinguish them from others of the same district. The Vermilion lead at Gold River was named such on account of the boulders traced to it being coloured by oxide of iron, and the Rose lead of Montague received its name from the peculiar colour of the quartz boulders years before the lead itself was discovered.

Cross or Fissure Veins. A few important veins cut across the strata for a considerable distance, and in some districts, as Brookfield, Leipsigate, Central Rawdon, and Cow Bay, they form the principal auriferous deposits. These cross veins, frequently spoken of as fissures, are usually traceable for some distance in a straight line, but some of them, like the Leipsigate, curve and branch. Two important fissures, the Libbey and the Leipsigate, dip towards the axial plane and curve towards the end of the dome. Inclusions of the country rock are common. A gouge is found on the walls of the cross veins, but less frequently on the interbedded veins. Seldom does a cross vein lie in a fault plane. Exceptions to this rule are the Cope lode of Central Rawdon and the Baker vein of Oldham. In the former the slickensiding and the curving of the strata on approaching the break show that there has been a movement along the plane of the break. In the latter the irregularity in thickness and direction is probably due to a motion along the break as well as to a difference in the resisting power of the alternate beds of quartzite and slate. The cross veins do not attain a great thickness except at their intersection with the interstratified leads. The Libbey vein at Brookfield averages 14 inches, but increases to 150 inches at its intersection with the Mill lead, and the Leipsigate vein, which probably has a length of 9,000 feet, varies from 12 to 50 inches. The mineral content is the same as that of the interbedded veins, but the laminated structure is wanting.

Angulars. Many of the main veins give off branches passing into the foot-wall and hanging-wall. These branches are termed angulars, and as they play an important part in the ore deposition in certain veins they are carefully studied by the prospector. The line from which an angular passes from the main vein into the hanging-wall is usually higher than that from which it passes into the foot-wall, and the intervening part of the vein is frequently thicker and richer than other parts. These branches were called feeders by the old prospectors, because when they were discovered on the surface in the hanging-wall rock they were taken as indications of rich ore where they entered the main vein. On the other hand those that passed into the foot-wall from the lower limit of pay-ore were called robbers. In some places the angular lies parallel with, but distinct from, the vein for some distance before entering it and becoming incorporated with it. In crossing the bedding it runs nearly perpendicularly across the quartzite, but obliquely through the slate. Some of these erratic veins are found to pass a short distance into the country rock and lose themselves in a ramification of veinlets; others form a network of veinlets crossing the strata from one lode to an overlying or underlying one.

Their distribution on the dome is dependent on the rock structure. In some parts of a dome they may be numerous, occurring in groups and forming a prominent feature in the deposition of ore in the main leads, whereas other parts of the dome may have been quite unfavourable to their formation. Their attitude is also dependent on the rock structure and in a certain part of a dome they may have a general strike and dip quite different from what is found in another part of the dome.

The mineral content of the angular is similar to that of the main lead, but the quartz is rather of a fine, granular texture and can be distinguished by the miner. It differs also from the interbedded vein in being free from laminations.

Bull Veins. There is another kind of vein differing much from those already described. It may cross the strata or lie in a stratification plane. It shows little or no trace of lamination, carries few metallic minerals, and is composed of white, coarsely crystalline quartz in which geodes with quartz crystals are sometimes found. These veins are usually thicker than the others, varying from one to several feet. They are not auriferous and are known as bull veins.

ORE DISTRIBUTION

The early prospectors and miners were not long in learning that all the veins are not equally auriferous, and they soon found it advisable to turn away from the coarsely crystalline white quartz to those laminated veins of oily quartz carrying sulphides. In a few auriferous veins the gold seems to have had a fairly uniform distribution, but experience has shown that in the most of them there was more or less segregation into pockets or shoots.

Some of the richest ore mined has been found in pockets.[1] In the Blackie lead at Oldham the gold was found aggregated chiefly in nodules of arsenopyrite, and in the Hay lead, lying 1,800 feet north of the anticline of the same district, an isolated pocket carrying[2] 60 ounces of gold was found at the intersection of an angular with the main lead. Further explorations on this lead failed to reveal more gold. Other large nuggets have been found in such veins as the Annand at Montague and the Dunbrack at Oldham. The West Lake mine furnished ore so rich that one crushing of 13 tons[3] yielded 234 ounces.

The great proportion of the ore, however, lies in shoots having a more or less definite boundary and direction. They vary from 20 to 60 feet or more in breadth, and are frequently accompanied by a thickening of the vein. Many shoots in interstratified veins have been worked to a vertical depth of 300 and 400 feet, and in two cross veins, the Lake lode of Caribou and the Libbey of Brookfield, to a vertical depth of 1,000 feet. That in the Libbey vein was worked throughout a length of 2,000 feet on the incline. A shoot in the Hard lead, South Uniacke, was followed 1,200 feet on a dip of 28 degrees east, and that in the Sterling Barrel lead, Oldham, has been worked to a depth of 1,900 feet on the dip varying from 30 degrees to 43 degrees.

As a rule, pay-shoots are composed of the rolls that have been already described, that is of those parts of the veins in which there is some irregularity in size, form, structure, or composition.

The interbedded leads are also frequently found to be very rich at their intersection with angulars, as well as in the thickened parts lying between the lines of intersection with angulars from below and from above. In passing, therefore, from an angular into a main lead one usually finds the auriferous part of the latter in that part which forms an obtuse angle with the angular. All angulars do not enrich the leads they cut and frequently only a set coming from some one particular direction has favoured the enrichment of the leads. The angulars themselves are usually barren, but some have proved gold-bearing, especially in those parts where they cut across slate beds. Those cutting and enriching the St. Patrick and York leads of Montague were themselves found rich and were worked for several feet in the whin foot-wall.

---

[1] Rept. Dept. of Mines, N.S., 1876, p. 55.
[2] Rept. Dept. of Mines, N.S., 1878, p. 26.
[3] Rept. Dept. of Mines, N.S., 1878, p. 24.

Bull veins are barren, but at[1] Mount Uniacke, where such a vein lies on one side of the Nugget lead and comes in contact with it at intervals of several feet, the Nugget lead pinches at the points of contact and the bull vein becomes rich enough to warrant crushing.

There is much irregularity in the distribution of the ore in the belts; in some all the veins are auriferous, in some only one, and in others one vein is auriferous for some depth then becomes barren, and an adjacent one becomes auriferous.

That there is some order in the distribution of the shoots was pointed out by Poole[2] as early as 1878. In his report for this year he called attention to the series of shoots on the north side of the dome at Goldenville. The shoots in the Dewar, Middle, and Wellington leads, as well as in the other overlying leads that have been worked, all dip to the west, and the paying ground of each succeeding lead lies to the west of that of the underlying lead to the south, the series of shoots thus forming a line running northwest from the centre of the dome. A study made by Faribault of the plans of the different gold districts reveals a linear arrangement of the outcropping of the pay-shoots in nearly every district. In the case of sharply folded anticlines the line runs roughly parallel with the axis or diverges slightly from it in radiating from the centre of the dome, and in broad folds the line diverges still more from the axis. The shoots dip in the general direction of the plunge of the anticline, and at about the same angle. In some veins two or more parallel shoots have been found. The rich shoot on the Hard lead, South Uniacke, really consists of two streaks lying 40 feet apart; in the Mulgrave lead, Isaac Harbour, a shoot 30 feet broad lay 180 feet below another 12 feet broad, both dipping west at an angle of 12 degrees; and in the No. 1 or Sims lead, East Rawdon, seven pay-shoots dipping east and separated by barren quartz were met in a shaft 510 feet deep.

The distribution of the shoots is frequently dependent on some subordinate flexure or crumple in the strata. For example, the large series of ore-bodies worked at Renfrew is due to a subordinate undulation in the strata on the south limb of the dome. So also the rich parts of the West Lake, Nuggety, Little, and Borden leads, Mount Uniacke, were determined by a subordinate crumple affecting all of them. In this regard, each district has its individuality, the structure of one dome never being just the same as that of another. The distribution of the pay-shoots, consequently, is never exactly the same for any two districts.

---

[1] Gilpin, E.: Trans. of North of England Inst. and Min. Eng., vol. 31, p. 158.
[2] Rept. Dept. of Mines, N.S., 1878, p. 26.

In cross veins the ore-body is found, in some cases at least, to lie at the intersection of the vein with certain strata. At Cow Bay it dips south at the same angle as the strata, and follows certain beds highly charged with pyrrhotite. The shoot, followed 2,000 feet in the Libbey vein, extended from its intersection with the Mill lead on the north to the vicinity of its intersection with the Jim lead on the south.

Pay Zone. Certain facts point to the existence in most districts of zones extending to an indefinite depth in which a succession of auriferous, interbedded, quartz veins of similar character and extent lie superimposed one above the other. On the north limb of the anticline at Goldenville several parallel veins lying close together pass under one another, and each has been worked to some depth beneath the overlying veins. An example of superimposed ore-bodies on the apex of the anticline is found at Isaac Harbour on the west side of the harbour where the workings of the Burke lead were carried below those of the Archie, McPherson, and Saddle leads. At Mount Uniacke a series of pay-shoots was worked on the West Lake, Nuggety, Little, and Borden leads, where they are affected at successively greater depths by a subordinate crumple with an axial plane dipping north at a high angle.

The observation of these and numerous other similar relations led to the propounding of the pay-zone theory by Mr. Faribault.[1]

The subordinate flexures and peculiarities of structure, on which the distribution of pay-shoots depends, extend to an unknown depth, and it is claimed that interbedded veins and pay-shoots should succeed one another with depth so long as the structural conditions continue the same as those producing the pay-shoots exposed at the surface. These structural conditions generally extend in depth parallel to the axial plane of the dome. Thus a pay-zone is produced that coincides on the surface with the area over which the pay-shoots outcrop, and which extends parallel with the axial plane of the dome to an indefinite depth.

Although the hypothesis may be of fairly general application it is not claimed that it will hold in all particular cases. Structural features vary with depth; subordinate folds may die out and main folds may flatten, and thus the pay-zone may die out or be shifted in position with regard to the anticlinal axis. For example, in the case of the Dufferin mine, Salmon river, rich ore was found at the apex of the fold at the surface, but more remote from it in the lower veins owing to the flattening of the dome.

The hypothesis was put to the test at the Bluenose mine, Goldenville. Crosscuts were made from the Springfield belt towards the axial plane at depths of 280, 364, and 460 feet, and several saddle veins were cut that do not show on the surface. The most important of these, the McNaughton, was worked extensively on the south leg. Parts of the Dunstan and other veins intersected by the crosscuts were also worked, the auriferous portions of all forming a zone about parallel with the anticlinal axial plane.

In this discussion is involved the whole problem of deep mining. The existence of pay-zones of unknown depths and the analogous character of the Nova Scotian veins and Bendigo reefs, which have been worked successfully to a depth of 3,000 feet,[1] and proved auriferous at over 4,000 feet, have led many to think that deep mining could be carried on with profit.

---

[1] Geol. Surv., Canada, vol. V, pt. AA, p. 57, and vol. X, pt. A, p. 109.

It is a question whether in the propounding of the pay-zone hypothesis too much emphasis has not been laid on the function of peculiarities of rock structure in the deposition of ore to the neglect of other factors that may have entered into the problem.

GENESIS

The veins were formed in the openings produced by the movements of the strata. During the folding of the interstratified beds of slate and quartzite, or shale and sandstone, there was a certain amount of slipping of one bed over another. This slipping produced openings along the bedding planes, which were in general widest at the apex of the fold and decreased in width down the limb until at a depth of a few hundred feet they pinched out. During or subsequent to the formation of these openings, which took place within the less resistant beds, the vein filling was introduced by solutions. Thus is explained the dependence of vein distribution on rock structure. The arching of the rocks on closely folded symmetrical domes produced fissures passing over the apex down each limb; on broad domes the arches were not strong enough to sustain themselves and the fissures were formed only on the limbs; on unsymmetrical domes the slipping of the strata was such as to produce fissuring along the bedding planes of the limb with the higher angle of dip; and subordinate flexures in which the strata were given a curve of less radius than ordinary were especially favourable to the production of fissures.

The process of folding was long continued, and the deposition of vein matter probably took place during the process. Small fissures were formed along the bedding planes and filled with quartz, only to be followed by other parallel openings between the quartz sheet and the slate and further precipitation of quartz in the new openings. Films of slate adhering to the quartz forming the wall of the new fissure thus became embedded in the vein. A succession of such events produced the laminated character of the interstratified veins. Another explanation that has been given of the laminations is that quartz was deposited in the slate along a number of parallel planes lying close together in an area of minimum pressure and that the quartz films increased in thickness through a widening of the spaces either by the folding of the strata or by metasomatic replacement.

The origin of the corrugations is dependent on the rock folding and the following explanation has been suggested. Many veins were formed long before the folding processes were completed and during the subsequent stages they were subjected to the same forces as the rocks. The main forces that brought about the folding were horizontal, and produced a tendency towards a thinning of the beds on the limbs and a proportionate thickening at and near the apex. This expressed itself in a motion of the more plastic beds from the limbs towards the apex. Any quartz veins already formed in the slate partook of the same lateral motion and became corrugated. These corrugations are of the nature of drag-folds, the higher bed of quartzite on an anticline having moved upward with regard to a lower bed and effected a dragging motion in the intervening slate and quartz.

---

[1] The Australian Mining Standard, Nov. 18, 1908, vol. XL, p. 556.

Origin of Mineral-Laden Solutions. Three different opinions have been held as to the origin of the minerals by which the fissures were filled: (1) that they were deposited from descending solutions; (2) that they were dissolved out of the country rock; (3) that they were deposited from ascending solutions. Little evidence has been adduced in favour of the first, and the two most generally held are the second and third.

The lateral secretion theory found an exponent in Gilpin,[1] who points to the fact that of the two kinds of country rock the slates alone carry gold of any appreciable amount. He also points out that most of the interbedded veins occur in slate and the richer parts of the fissure veins commonly follow the intersection of the vein with slate beds. He expresses the opinion that

> "so far as the subject has received attention the slates appear to be the source of the gold. The metal, in common with various metallic compounds, may have been carried and deposited in the layers as they were forming. That which fell in the sand would, presumably, for the most part, accumulate in the underlying bed of denser material, forming the first stage in the concentration now presented."

He suggests

> "that the gradual deposition of gold from currents in the beds of clay or mud and sand might, through special currents, be accelerated or specially increased at certain points, and that from this enriched material the veins derived their 'pay-streaks.'"

Woodman[2] expresses the opinion that most of the quartz of the interstratified veins was introduced rapidly by ascending hot solutions, and that possibly a small proportion of the gold had a similar origin. Regarding the origin of the sulphides in the country rock and in the veins, and the genetic relations existing between the two, the evidence adduced so far has been insufficient to lead to any final conclusion. But the

> "method of occurrence of gold in the veins of this series, its distribution in the country rock, and its relations to sulphides point strongly to the conclusion that at least a large part was deposited in the sediments and has been long in process of concentration in veins by water which comes downward from the surface. It is possible that not all the gold in a region of so complicated a history has the same source; but while some may have been brought up with the quartz, the facts so far observed do not show that more than a small share of it had that origin."

These remarks do not apply to the productive cross veins or fissure veins, for in these "the structure of the veins and the character and positions of the accompanying minerals point strongly to a deep-seated origin for the metal."

Faribault and others are of the opinion that the veins were filled by ascending solutions. These found a passage upward through the fractured portions of the domes. A fracturing across the bedding, as well as fissuring along the bedding planes, seems to have been necessary for the formation of veins and ore deposits; veins are not commonly found along straight, non-plunging anticlines, although there was, no doubt, a great deal of fissuring along the bedding planes; on the other hand, where the anticlines plunge and the rocks were fractured across the bedding, veins are abundant. The cross fractures are themselves filled with quartz forming the angulars entering and leaving the interbedded veins. The cross fractures seem, therefore, to have provided channels for the passage of solutions across the beds of quartzite and slate to the interbedded fissures along which deposition took place. That the solutions entered by way of the angulars is borne out by the fact that the rich parts of interbedded veins are those parts lying between the line of entrance of an angular and the line along which it leaves the main lead.

---

[1] Proc. and Trans. Royal Soc. Canada, vol. VI, sec. IV, p. 63.

[2] Proc. Boston Soc. Nat. Hist., vol. 28, No. 15, pp. 391 and 395.

The source of the ascending solutions is not known. Near the outlet of Moose lake in the western end of Mooseland gold district a few auriferous interbedded veins have been traced to the granite, but without increase in size or other irregularity. At other places, as Country Harbour and Forest Hill, interbedded veins are cut by dykes of granite, and the proximity of the intrusion appears to have had little or no effect on the size or richness of the veins.

Dawson[1] expresses the opinion that the granite intrusion and the formation of the gold veins may have been "roughly contemporaneous." It has been suggested, also, that, as the cooling and solidification of the granite was long continued, the auriferous veins may have been formed by solutions given off from one portion of the granite mass and afterwards cut by dykes given off from other portions of the mass that were a little later in solidifying. Or it may be that veins were formed from solutions given off by one granitic intrusion and cut by dykes from a somewhat later intrusion.

Further light may be thrown on the problem by a study of those deposits where it is said feldspar forms a part of the gangue, as at Lower Seal Harbour, or where there are numerous veins carrying mica as at Cochrane Hill, Crows Nest, and Forest Hill. A study of the genetic relations of the interbedded scheelite-bearing veins of Moose River may also be of service in this connexion.

In conclusion it must be said that, although certain field relations indicate that the veins were formed prior to the granite intrusion, the question of the source of the solutions is still open.

Precipitation. Little study has been given to the cause of the precipitation of the metallic contents of the veins. Certain slate beds apparently exercised a greater precipitating effect than others. These are generally black and are frequently impregnated with arsenopyrite, pyrite, or pyrrhotite, and the interstratified veins that can be worked with profit are usually found in beds of this character. In some cases the cross veins also are found to be enriched where they lie in contact with strata of this class.

---

[1] Acadian Geology", Third Edition, Supplement, p. 85.

MINING, MILLING, AND METALLURGY

Two systems have been employed for recovering the ore, the open-cut and underground mining. The open-cut system is employed on large belts of slate carrying numerous quartz veins, the whole mass of slate and quartz being sent to the mill.

The usual method of underground mining has been to sink incline shafts on the dip of the lead and follow the ore by means of levels. Frequently a succession of shafts was sunk on the same vein, each successive shaft being deeper or shorter than the preceding, depending on the pitch of the ore-body. The sinking ceased on passing through the pay-shoot; although in the early days, before much was known about the distribution of the ore in the veins, much labour was lost in many cases in continuing shafts into barren parts of the vein. In some cases the ore has been most economically removed by sinking the shaft on the pitch of the shoot. The policy in the past was generally to limit operations to the vein on which the shaft was sunk, but with an increase in the knowledge of the structure of the rocks a system of crosscutting has been more generally adopted.

The bed of slate carrying the lead is usually from 1 to 4 feet thick, and is soft and easily worked. When the slate bed is thin a bed of quartzite has to be removed, also, to afford room for the workmen. As the slate is removed the quartz is loosened from the wall by means of the pick and bar, or by blasting, and in some places where the gold is nuggety, a great deal of slate is removed exposing a large surface of the vein before any ore is broken down. This prevents much of the pilfering of which the Nova Scotian miner has been accused. The whin furnishes smooth and firm walls that often obviate the necessity of much timbering. The support of the hanging-wall becomes a more serious matter in veins that dip at a low angle and resort must be had to more timbering.

One great advantage that the Nova Scotian gold miner possesses is the small amount of water that enters the mines, workings being exceptionally dry in the unfaulted parts of the districts.

In the early days the arrastre and the small stamp mill were used for the recovery of the ore. In more recent years the stamp mill has been used, cyanide plants installed, and concentrating tables employed for saving the arsenopyrite. The recovery of the gold has been far from complete and assays made thirty years ago by F. H. Mason[1] showed an astonishingly high content of gold in tailings from the plates and from dumps. C. S. Parsons[2] in 1922 found that samples of tailings from a mill treating $3 to $4 ore carried 60 cents a ton in gold and samples of tailings from a mill treating $12 ore carried $4.40 a ton. Old tailings dumps throughout the province were sampled, their tonnage estimated, and the gold, silver, and arsenic content determined. None of these old dumps contained values worth considering. Parsons, pointing to the fact that the gold in the tailings as determined by Mason's assays is not there now, says: "If it ever was there, and the tailings from the mills operating at the present time would indicate that it was, it is an interesting problem to determine what has become of it and how it was taken out." The suggestion has been made that the cyanide that was lavishly used for dressing the plates gradually leached the gold from the tailing dumps.

---

[1] Gilpin: "Ores of Nova Scotia", 1896.

[2] Mines Branch, Sum. Rept. 1922, pp. 162-170.

DESCRIPTION OF THE GOLD DISTRICTS

INTRODUCTORY REMARKS

The following sketches of the districts are at best exceedingly fragmentary. With regard to the geology, the character of the deposits, and the general development the available information is in many cases very incomplete. Much information that might prove of great value has been lost through the general neglect, especially in the earlier days, to keep plans of the workings, showing the extent of development and the character and value of the ore extracted.

With regard to the history it was seldom that sufficient data were available to make a connected and readable account of the events taking place in any particular district; in fact, so meagre were the data in some cases that little else could be given than a list of the companies operating during different years and of the properties on which operations were conducted. Considerable difficulty arises in tracing the development of any particular deposit on account of different names being applied to the same vein in successive years or even in the same year, also on account of the names of companies being frequently given without any information as to what particular deposit was being worked. Properties have changed hands, mines have been closed and reopened, and companies have been formed and passed out of existence of which little or no record has been kept. The history must, therefore, often be lacking in balance and due proportion, and can be little more than the joining together of a few facts making a much broken and disconnected chain.

Suggestions are sometimes given as to the course it might be advisable to pursue in further explorations. It must, however, be remembered that some of these are based on the pay-zone theory, which has been advanced not without strong evidence by Faribault, but which, while of general application, it is admitted by himself may fail in certain particular cases where conditions change with depth.

Incomplete and distorted as these sketches must be, they are given to the public in the hope that some of the contained information will be of value, especially to those interested in any particular district.

As has been explained already, the veins occur usually in groups, and to a locality in which one or more veins of a group have been worked the term district has been applied. The districts were surveyed into small, rectangular divisions known as areas, which were usually laid out according to the general strike of the veins. The size of the areas is 150 feet by 250 feet, although some were at first only 20 feet by 50 feet, and the shorter dimension is in the direction of the strike of the vein. In a few districts, however, they were surveyed with their longer dimensions running magnetic north. The larger subdivisions of the districts are called blocks, each of which comprises 1,000 areas. Plans of the most important districts have been published by the Geological Survey.

ARDOISE

Ardoise gold district is situated in Hants county, 5½ miles east of Ellerhouse station on the Dominion Atlantic railway.

The veins[1] lie in the pyritous slates of the Halifax formation a short distance south of the synclinal axis, and about 2 miles north of the Rawdon Mines anticline. The strata here are overturned; they strike about north 65 degrees east (magnetic) and dip south 80 degrees, forming a broad curve with its convexity facing south, similar to that on the south limb of the dome at Mount Uniacke.

The most of the veins are of the interbedded type and show rolls dipping at high angles. A 14-inch belt carrying five veins has received some attention. One vein, known as the Big lead, is composed of rolls 6 inches to 36 inches thick, dipping east

---

[1] Geol. Surv., Canada, Ann. Rept., vol. XII, pt. A, p. 182.

72 degrees; angulars enter this from various directions. The main lead has rolls 1 inch to 10 inches thick and the Little Rich lead is 3 inches wide. A cross vein, known as the Mason vein, is 4 inches wide and carries a large proportion of sulphides.

A discovery[1] was reported from this district in 1868 and considerable prospecting has been carried on at various times, but it has not led to any extensive mining. A 10-stamp mill was erected, and a few shafts were sunk, but to no great depth. Some of the veins were tested by open-cuts a few feet deep. Some assays made by Mason, of Halifax, of an auriferous slate belt holding quartz veinlets, would seem to warrant development work.

BEAVER DAM

Beaver Dam gold district is situated in Halifax county on the Killag branch of West river, Sheet harbour, 7 miles east of the Musquodoboit coach road.

The Goldenville formation, here much metamorphosed, is folded in an overturned anticline running northwest and southeast. The strata on the south limb dip north at angles varying from 75 degrees to 85 degrees; those of the north limb dip north at lower angles. The country is low and drift-covered and hence difficult to prospect. The veins are of the interbedded type and those that have received the greatest attention lie on the south limb. Much rich drift was found in the northwestern part of the district on the Van Buskirk areas, and the veins exposed here in trenches cut by Dimock and Zwicker lie on the north limb of the fold.

A discovery was reported from this district in 1868, and in 1871 a 15-stamp mill was erected and two belts of promising veins were opened. Later on, D. J. Thomas worked here a few months for an English company, but the district received scant attention until William Yeadon became interested in 1886. During this year there was considerable prospecting, Yeadon erected a 4-stamp mill, run by water power, and carried on development work. He also carried on steady work during the following year. In 1891 Mr. Yeadon sold out to the Beaver Dam Mining Company and the tests made by this company were so promising that a 10-stamp mill was erected. In 1891 work was managed for this company by D. S. Turnbull. Little seems to have been done, however. In 1895 the property was leased by G. M. Christie and Wm. Tupper, who had fifteen men employed, but apparently did not carry on very extensive operations. In 1896 the mine passed into the hands of J. H. Austin, who erected a 10-stamp mill.

A few years later considerable prospecting was done by Messrs. Levi Dimock and Gordon Zwicker on the Van Buskirk areas about one mile west of the other workings of the district, and several corrugated auriferous leads were cut dipping north.

In 1904 a 5-stamp mill was erected in this district by W. H. Redding and a new mill licence taken out.

Developments are limited, but sufficient to show that auriferous veins are distributed along the anticline for a distance of at least a mile, in some cases forming large deposits of low-grade ore. In 1902 a 98-foot shaft had been sunk on a belt 15 feet wide, and crosscutting 62 feet north and 39 feet south revealed an auriferous belt 74 feet wide, half of which was quartz and slate, giving an average value by sampling of $3.50 per ton. The same belt was uncovered 400 feet farther west. The surface trenches cut by Dimock and Zwicker across 785 feet of strata also exposed a great number of leads, some of which were found to be auriferous.

In 1911 the Gladwin Mining Company carried the Redding shaft to a depth of 68 feet and continued operations for a short period in 1912 during which time 59 ounces of gold was recovered from 99 tons of ore. In 1921, E. H. Gladwin and Company tested the Austin and Thomas property, recovering 25 ounces 11 pennyweights of gold from 55 tons of rock crushed. In 1922 a production of 17 ounces of gold was obtained from 25 tons of ore. The two principal shafts are the west end shaft and the east end shaft. The former, on area 902, was 77 feet deep, drifts had been carried east 46 feet and west 28 feet and a crosscut driven 26 feet south; the latter, on area 426, was 92 feet deep, drifts had been carried east 26 feet and west 67 feet, and crosscuts driven 62 feet north and 29 feet south. In 1926 William Papke was engaged in prospecting. In 1927 the Austin shaft was unwatered, the south crosscut was extended to a distance of 294 feet, at the end of the crosscut a diamond drill-hole was bored a distance of 90 feet south, and in the crosscut 60 feet north of the shaft a hole was drilled 99 feet. Work was then discontinued.

---

[1] Rept. Chief Commissioner of Mines, Nova Scotia, 1868, p. 8.

BLOCKHOUSE

Blockhouse is situated in Lunenburg county a short distance west of Mahone Bay, and 1 mile west of Blockhouse station on the Canadian National railway. The chief workings in this locality are on a cross vein about 1 foot wide, running north 13 degrees west and dipping 70 degrees, with a pay-streak dipping south at an angle of 35 degrees to 40 degrees. The vein crosses the west end of a dome at right angles to the strike of the strata where the Goldenville formation is exposed in an ellipse half a mile long and a quarter of a mile wide. The pay-shoot is on the south side of the dome and dips at about the same angle as the strata. A few interbedded leads have been prospected on the eastern plunge of the anticline a few hundred feet northeast of Blockhouse station, and a shaft was sunk 40 feet by the Victoria Gold Mining Company.

This is one of the recently discovered gold districts and there were only three years, 1888-1901 inclusive, during which the production reached any considerable amount, and during that time the yield averaged over 1½ ounces per ton.

It is said[1] that the first auriferous drift found in this district was discovered a little west of the present mine in 1879 by a man named Ernst, but the discovery attracted little attention. This discovery in 1885 of a gold-bearing boulder near the present mine led to considerable excitement and a number of areas were taken up. The first prospecting was done by J. B. Millet on the north side of the Mahone and Bridgewater roads and some rich drift was found. In 1886 Joseph Mills spent some time prospecting here. Attempts were also made by Adam Griswold, Chas. McClair, Lawlor, and Allen, and others to find the source of the rich drift, and much trenching was done to strike the lead, which it was believed had an east and west direction. In 1895 there was exposed a 7-foot lead of very low-grade quartz about 300 feet west of the present mine.

The first to recognize the fact that the drift came from a cross vein was W. H. Prest, who took charge of the prospecting on January 15, 1896, and by a careful study of the direction of glaciation and by following the line of drift boulders rather than by deep trenching succeeded in discovering on the 28th of the same month the lead on which mining operations were afterwards carried on. The Blockhouse Mining Company was incorporated and with W. H. Prest as manager carried on active mining operations. The vein was opened a length of 320 feet and two shafts were sunk 140 feet and 72 feet. Some leads were also cut on the property to the north. The mine was soon after closed down, and although some work was done in the district in 1897 no returns were made between 1896 and 1899.

In 1897 Godfrey Smith had four men prospecting north of the Blockhouse Mining Company's property, and still farther north A. A. Hiseler sank a 46-foot shaft on the continuation of the Prest lead.

In 1898 Miner T. Foster acquired the property formerly worked by W. H. Prest, started in December to erect a 10-stamp mill, and in April of the following year the mill was in operation and mining was vigorously carried on. In 1899 and 1900 good returns were made, and in 1901 stoping was actively conducted under the management of Chas. McClair, fourteen men were employed, and good returns were made. This year a Wilfley table was put in to save the sulphides. Work, however, was discontinued in March, 1902, when operations had been carried to a depth of 200 feet and 400 feet along the vein, and although some prospecting has been done no returns have been made since.

The Victoria Gold Mining Company did some prospecting on some interbedded leads on the eastern plunge of the anticline a few hundred feet northeast of Blockhouse station, and a 40-foot shaft was sunk. In 1923 F. T. Foster did 400 feet of trenching.

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1899	980	0	0	564	1	14	18
1901	808	0	0	465	1	14	18
	1,788	0	0	1,029			

---

[1] Ind. Adv., Feb., 1900, p. 19.

BROOKFIELD[1]

Location

Brookfield district is situated in the northeastern corner of Queens county on the Caledonia branch of the Canadian National railway, Brookfield Mines being the name of the station.

Geology

The strata are here folded in a broad anticline plunging to the east and west to form a dome, the centre of which lies to the west of the most productive part of the district. The dip of the strata on the north limb varies from 40 degrees to 65 degrees, and on the south limb from 20 degrees to 45 degrees. The lowest strata are the bluish and greenish grey quartzites of the Goldenville formation. Some distance north and south of the district these are overlain by greenish slates followed upward in turn by blue and black slates.

Character of the Deposits

Both interbedded and cross veins occur in this district, but conditions do not seem to have been favourable for the deposition of ore in veins of the first class, and operations have been practically limited to the second class. Of the interbedded leads only those that are intersected by angulars are auriferous and they become poorer with distance from the intersection. Of these the most important are the Nelson and South leads, the former worked to a depth of 180 feet. Three important cross or fissure veins, the Libbey, King, and East mine, have been mined. They dip at high angles towards the dome and the ore occurs in pay-shoots lying along the intersection of the cross vein with interbedded veins or with certain rock strata. In the Libbey vein, from which the large proportion of the ore of this district was taken, the pay-shoot dips west 30 to 40 degrees and consists of that part of the vein limited approximately on the west by its intersection with the Mill lead and extending a short distance east of its intersection with the Jim lead. At the East mine vein, thought to be the continuation of the Libbey, the pay-shoot dips southeast 50 degrees and coincides with the dip of the strata. Among the other veins that have received more or less attention may be mentioned the King and Dunbrack.

History

It is said gold was discovered in this district in 1885, and in 1886 mining development was actively carried on. The most important work was on the cross vein afterwards made prominent by the extensive operations conducted by W. L. Libbey. The history of the district is to a great extent the history of this vein, and it was the yield from this deposit that placed Brookfield for a number of years in the foremost rank of the gold districts of Nova Scotia.

In July, 1886, the vein was acquired by John McGuire and some American associates known as the Brookfield Mining Company. Under Mr. McGuire's management a considerable amount of ore was mined and hauled to Pleasant river for milling. The results were so satisfactory that he felt justified in erecting a mill and this was started the same year. Mining was vigorously prosecuted in 1887 and 1,418 ounces of gold was extracted from 1,691 tons of ore. The workings were not carried to any great depth and when a break was encountered the following year the mine was shut down.

In 1888 some prospecting was carried on by Peter Dunbrack, and he was rewarded by the discovery of a cross vein 12 to 15 inches wide in the southeastern part of the district. This was acquired by the Philadelphia Mining Company and a tramway was built to the Brookfield Mining Company's mill, which was leased. Mining was vigorously pursued in 1889 by this company on the Dunbrack vein, indicated on the plan as the East Mine vein, and on the Nelson lead, and the ore was crushed at the Brookfield Mining Company's mill. The Philadelphia Mining Company, however, completed a 20-stamp mill of its own this year, and continued to make good returns in 1890. The same company did a limited amount of work on the East Mine vein in 1891 and 1892 under the management of Geo. A. Kenty, and small returns were made.

---

[1] Plan in pocket.

No returns were made in 1893, but it seems that in the latter part of the year John McGuire returned to the district and made some tests preparatory to reopening his old mine and treating the tailings dump by some chemical process. The property apparently soon passed into the hands of the Brookfield Mining Associates, W. L. Libbey, manager, for this company made returns in 1894, and in 1895 an incline had been sunk on the vein from the engine house through the old workings to the bottom of the main shaft and a large quantity of ore stoped out and milled. During this year the old Philadelphia mine in the eastern part of the district was bonded by M. T. Foster and Herbert Dixon, pumped out, and repaired, and a small amount of ore crushed; and Peter Dunbrack obtained by mortar a small amount of gold from a vein he had recently discovered in the northwestern part of the district.

In 1896 a large amount of ore from the Brookfield Mining Associates property was crushed and important additions were made to the plant to secure a better extraction of the gold and increased economy in the management of the business. A 20-stamp mill was erected and work was started on a chlorination plant for treating the concentrates. Three men were employed on the Dunbrack lead in the northwestern part of the district and fourteen men were at work for a time at the Foster and Dixon mine. This last mine was closed, but in 1897 it was again unwatered, this time by the Philadelphia Mining Company, and a small amount of ore was crushed.

The chlorination plant of the Brookfield Mining Company, Limited, was completed early in 1897 and was at once put into operation. Operations were vigorously carried on at this mine and over 4,000 ounces of gold was reported. This mine, commonly known as the Libbey mine, continued a steady producer until 1906, and a study of the returns for the district will show on what an extensive scale operations were carried on. The yearly returns form a record of the history of the mine. It is a story of continual development and production. In 1898 and 1899 about seventy men were employed, a 20-stamp mill and concentrators were kept running, and the concentrates were treated by the Thies process of barrel chlorination. In 1899 the seventh level was driven at a vertical depth of 582 feet. In 1901 the tenth level was driven at a vertical depth of 762 feet, and eighty men were employed. In 1902 the eleventh level was started, and besides stoping the cross vein a small amount of work was done on the Mill lead. During the next year all the work was confined to the area below No. 9 level, and 300 feet were driven on the twelfth level and 80 feet on the thirteenth. Some experiments were made by C. D. Maze with the bromo-cyanide process of treating the tailings, and the question of putting in a cyanide plant to replace the chlorination plant was under consideration at the time of the inspector's visit and before the end of the year a bromo-cyanide plant was erected.

In 1904 the work was confined to levels 11, 12, 13, and 14, and a vertical depth of over 1,000 feet was reached. The cyanide plant started operations and treated some old tailings beds, and stock from the mill. This plant was kept at work during 1905 and the fourteenth level was extended. In 1906 no returns were made, and early in the year this mine, which had been so successfully operated for 12 years under the able management of W. L. Libbey, was closed.

Work in other parts of the district has been of a very desultory nature. We saw that in 1897 the old Philadelphia Company's mine was reopened, and that year a small production was reported by J. B. Neilly. In 1898, 1899, and 1900, the same person is credited with a small yield. In 1899 R. L. Sherman had twenty-seven men employed on the Philadelphia Company's property for J. B. Neilly; some work was done on both the Nelson and East Mine veins; nearly 700 tons of ore was milled and the tailings concentrated by means of a Wilfley table. The mine was closed in 1900, but was secured by the North Brookfield Mining Company, Noble Crowe, manager, and in June, 1901, the East mine was unwatered. Early in 1905 a cyanide plant designed by H. S. Badger was erected and put in operation, and from 1,890 tons of ore crushed a yield of 868 ounces of gold was reported. Work was continued here during a part of the following year and the company returned 218 ounces of gold from 512 tons of ore.

In 1905 some rich ore was mined by A. M. King in the southern part of the district on a small body of ore known as the King streak. In 1906, a small return was made by A. M. King. During a portion of this year the Ophir Gold Mining Company had eleven men employed under the management of G. G. King on a

3-foot cross vein in the southern part of the district. A shaft was sunk 125 feet, a 5-stamp mill was erected, and a Wilfley table put in. In 1909, a little work was done and the 100-foot level was extended 175 feet.

In 1916 the Tommy Burns Gold Mines, Limited, made some tests of the King fissure vein and in 1922 the King Fissure Gold Mines, Limited, crushed 636 tons of ore, obtaining a yield of 137 ounces. A shaft has been sunk to a depth of 150 feet. At a depth of 100 feet a level has been driven east 40 feet and west 400 feet and at a depth of 150 feet a level has been driven east 14 feet and west 45 feet. In 1927 the workings on the King fissure were unwatered by the Acadia Exploration Company, Limited, under the management of William Papke, and an incline shaft 200 feet from the main shaft was deepened. This company continued operations in 1928.

General Development

The section accompanying the published plan of this district shows the extent to which the Libbey vein has been worked. An incline shaft follows the lower edge of the pay-shoot and reaches a total length of 1,997 feet. This would mean a vertical depth of 1,062 feet, assuming that the vein dips at an angle of 74 degrees to the south. In addition to the inclined shaft there are several shafts on the dip of the vein by which the ore near the surface was removed. Later a vertical shaft was sunk to the west to a depth of 350 feet to meet the inclined shaft. The inclined shaft was then continued along the pay-shoot. Ore was hoisted along the incline to the main vertical shaft through which it was then raised to the surface.

From the incline, levels were driven west, fourteen in number, and extending in length from 400 to 500 feet, and nearly all the quartz between these levels was stoped out. The fourteenth level was also extended east 178 feet to test the ground in that direction.

Some tests were made of the interbedded leads intersecting the Libbey mine. The Mill lead at a depth of 100 feet was followed for 30 or 40 feet and measured 8 feet 6 inches in thickness; in No. 8 level it was followed 40 feet west of the intersection and showed 18 inches of quartz in two veins lying close together. Another interbedded lead was driven on from levels Nos. 8, 9, 10, and 11 and showed 7 inches of quartz.

At the East mine three shafts have been sunk: the west shaft 235 feet, the middle or main shaft 300 feet, and the east shaft 205 feet.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1887	1,418	1	15	1,691	0	16	18
1888	....	....	....	....	....	....	....
1889	1,796	17	18	1,472	1	4	9
1890	1,643	5	0	2,500	0	13	0
1891	....	....	....	....	....	....	....
Year ending Sept. 30							
1895	1,992	3	4	3,344	0	11	21
1896	4,683	17	15	5,353	0	17	15
1897	3,366	10	0	8,076	0	5	7
1898	3,854	18	0	11,112	0	6	22
1899	2,982	18	5	9,212	0	6	11
1900	2,726	16	13	9,291	0	5	20
1901	3,253	10	0	7,709	0	8	11
1902	3,051	5	1	7,736	0	7	21
1903	2,872	11	0	10,143	0	5	16
1904	3,297	0	19	10,534	0	6	6
1905	4,866	19	4	12,657	0	7	16
1906	218	10	0	513	0	8	12
1908	2	5	0	15	0	3	0
1909	24	0	16	155	0	3	2
1910	23	2	12	90	0	5	3
1916	39	11	0	100	0	7	22
1922	137	0	6	636	0	4	7
	42,251	3	8	102,339			

CARIBOU[1]

Location

Caribou gold district is situated in the northeastern part of Halifax county, 6 miles south of Musquodoboit valley and 35 miles east of Shubenacadie station on the Canadian National railway, from which it is accessible by a good wagon road.

Geology

The district lies on a dome formed by the plunging of an anticline to the east and west, the anticline being the same as that which passes through Cochrane Hill and Cameron Dam. Folding and subsequent erosion have been sufficient to expose the upper beds of the Goldenville formation in the form of an elongated ellipse, 2,900 feet broad and 4 miles long; and more remote from the centre of the dome and overlying the quartzites are the slates of the Halifax formation. The dome has its centre on areas 328 and 329, block 2, and from this centre the axis runs north 79 degrees east (magnetic) plunging to the east at a higher angle than to the west, whereas the dip of the strata to the north and south increases gradually from a very low angle near the centre to 65 degrees on the north limb and 70 degrees on the south. There has been a certain amount of faulting, but nearly all the breaks are of a purely local nature with only slight horizontal displacement; one of these runs from the centre of the dome in a southeast direction, halfway between Burkner and Middle lakes, and another runs a little south of the anticlinal axis and nearly parallel with it.

Character of the Deposits

The two types of auriferous quartz veins are represented in this district, the interbedded and the cross vein, the former being found in the Goldenville formation chiefly in the slate beds interstratified with the quartzites, the latter chiefly in the lower beds of the Halifax formation near its contact with the Goldenville formation. Among the veins that have been most extensively worked are the Caffrey, Lake, Dixon, Burkner, and the McDonald. The first of these is an interbedded vein; the others are all cross veins found near the base of the Halifax formation, with the exception of the Dixon vein, which crosses the Goldenville formation at the western end of the dome. The cross veins usually cut the strata at a small angle. The outcroppings of the interbedded veins, as might be expected, form portions of ellipses, whereas those of cross veins lie in more or less straight lines of no great length, the vein extending in length but little beyond the pay-shoot. Many unexposed interbedded veins underlie those that come to the surface, and a vertical shaft sunk 70 feet in 1908 on the west plunge of the anticline just north of the old workings on the Flat leads (so-called) cuts nine leads ranging from 2 inches to 10 inches in thickness; all containing arsenopyrite and seven containing free gold.

Some of the interbedded veins worked on the western end of the dome are very flat, that is they dip at a very low angle, and thus render mining very expensive on account of the great amount of barren rock that must be removed to make room for the miners. In some cases they are worked by open-cut.

The ore occurs in many veins, and in rich shoots. In the McDonald vein, a vertical vein 1 foot thick, the ore occurred in rolls 5 feet thick dipping west 52 degrees and following the intersection of the vein with the strata. From a stope of 40 feet carried to a depth of 120 feet 1,170 ounces of gold was taken. The rich shoot on the Burkner was found to dip west 45 degrees, with its bottom following the intersection of the vein with the top of the Goldenville formation. One of the most striking examples of a pay-shoot in the gold fields of Nova Scotia is that of the Lake lode, in which an auriferous body of quartz, in some places at least 20 feet thick, and dipping to the west at an angle of about 45 degrees, has been followed to a vertical depth of 1,000 feet, and it is claimed by those who have worked in the mine and are well acquainted with the conditions that this shoot extends to still greater depths, but that the cost of removing the ore is excessive owing to the necessity of hoisting it 300 feet through the auxiliary winze, then tramming it to the main shaft for hoisting to the deck.

---

[1] Plan published.

Attention might here be called to the occurrence about a mile northeast of Caribou district at the north of Sherlock lake of numerous mineralized quartz veins on the apex of the anticline near the contact of the Goldenville and Halifax formations. It seems that these have as yet received little examination.

History

It is not known who was the discoverer of gold in this district, but among those who engaged in work here during the early days may be mentioned Messrs. Hyde, Bushing, Touquoy, Burkner, and Jennings. Some of the operations carried on in the early days at Moose River were described in the Reports of the Department of Mines under the heading 'Caribou.' This causes some confusion and it may be that some of the work noted in the following paragraphs was carried on in Moose River instead of Caribou.

Operations began in this district in 1867 and prospecting was prosecuted during the following year with such success that two crushers were built and put in operation in April, 1869, one of 10 stamps by Mr. Hyde and one of 8 stamps by Mr. Bushing. A tramway 3½ miles long was constructed to connect Mr. Hyde's mine with his mill on the south branch of Fraser brook. His operations were limited to what was later known as the Hyde lead and is indicated on the plan as the Caffrey lead. The lead was opened by seven shafts averaging about 50 feet in depth, and it was stoped from this depth to within 6 feet of the surface throughout a length of 600 feet. A lode was opened by Mr. Burkner 1,000 feet south of the Hyde lode. The Bushing belt, consisting of alternations of quartz and slate making a thickness of 20 feet, was found to branch at the east and one part turned northward. At the west end four shafts were sunk and four shafts also on the north branch and a considerable amount of stoping was done. Some work done during this year on a nearly horizontal lead known as the Dunbrack resulted in a yield of 71 ounces from 22 tons, and a little work done at the Touquoy mine on a small cross vein produced a ton of quartz that yielded 23 ounces. The returns from the district for this year show a yield of 1,001 ounces from 1,583 tons.

The Bushing and Hyde mines stopped work early the next year, probably from want of proper machinery. Late in 1871, however, the discovery of rich boulders on the Bushing areas led to prospecting that resulted in the discovery of a nearly horizontal lead, 5 to 10 inches thick, on the crown of an anticline. Three small shafts were sunk and a portion of the vein removed.

Mr. Touquoy worked continuously during 1870 and 1871, in the former year extracting 327 ounces from 338 tons and in the latter year 405 ounces from 380 tons of quartz. His work consisted of sinking, stoping, and open-cutting on the North, and the South or Flat leads, and on a cross vein.

In 1870, Messrs. Jennings and Wilson began operations on the Free Claim lode and continued work during the following year in the way of sinking, stoping, and open-cutting.

In 1872 work continued at the Pioneer mine on the Ritchie lode until April. This horizontal corrugated lode was 3 to 14 inches thick and lay within a few feet of the surface. Mr. Touquoy's work was limited to the North and South leads, on the former of which sinking, drifting, and stoping were prosecuted and on the latter open-cutting. On the Free Claim lead Messrs. Jennings and Wilson continued sinking.

Very little was done in this district in 1873, but in the following year a little more interest was shown. Mr. Touquoy, who had been working the Ritchie lode on tribute, returned to his own areas and resumed sinking and stoping. Work on the Hyde lead was resumed and Mr. Caffrey sank the shaft deeper and stoped a part of the vein. Some trenching was done on the Pioneer property and Messrs. Touquoy and Caffrey did some trenching on the so-called Reid block, and sank three small shafts.

About the only work done in 1875 was that by Mr. Caffrey on the Hyde lead, areas 227 and 228. In the following year work was continued on this lead by Messrs. Caffrey and Lawson, and an 8-stamp mill was erected. Mr. Touquoy returned to the district, prospected his areas and discovered a 3-inch lode, which, although yielding one ounce per ton, could not be worked profitably as the dip was so low as to necessitate the removal of much barren rock to make head room. In this year the

McDonald vein was discovered which yielded 2 ounces per ton. This rich pay-shoot held out until July, 1877, and 1,170 ounces were taken out from a stope of 40 feet within a depth of 120 feet.

In 1877, a shaft was sunk 115 feet deep on the McDonald vein on area 630 without finding paying quartz, and much prospecting was done in the vicinity, 1,500 feet of trenches being cut. Work on the Hyde lead on area 227 was carried to a depth of 250 feet, when the destruction of the mill and hoisting gear by fire brought operations to a close. However, Mr. Caffrey rebuilt his mill and engine-house and work was carried the next year to a depth of 270 feet. Some distance west of the Hyde lead, Mr. Touquoy opened in 1877 a cross lead 6 inches thick, which, yielding at first from 2 to 3 ounces, promised well, but in the end proved unprofitable. He also cut 4,000 feet of trenches on the anticline over a mile farther west, at the south end of McLeod lake, but found nothing of value. On the Jennings lead, area 474, and next the free claim, some stoping was done.

In 1878, much prospecting was carried on at the east end of Burkner lake, but although the boulders were numerous and rich enough to pay the expense of prospecting, the lead from which they came was not found; 40 tons of these boulders was collected and crushed, of which 7 tons yielded 15 ounces. On the Pioneer property a shaft was sunk 100 feet on two angling veins. On area 424 some stoping was done.

Several years succeeded in which work in this district was nearly at a standstill. In 1879, a little work was done by tributers, and in 1880, some work was done on the free claim lead, area 474, and Mr. Touquoy mined the flat lead west of the road. In the following year little was done except on the Lowell property, areas 373 and 374, and by R. G. McDonald and Company. In 1882, the old Jennings property received a little attention, and in 1883 the same property was worked by Mr. Caffrey for a short time. In this year, Mr. Touquoy worked a cross lead.

In 1884, Mr. McDonald was working near the free claim, the Caffrey mine was unwatered, and Messrs. Stuart, Gladwin, and others opened a lead near the lake and sank about 35 feet on it. The Lake lead, opened the preceding season, was worked successfully in 1885, during which year Mr. Touquoy continued operations and Mr. Wright worked on the Heatherington property.

In 1886, Mr. Bruce worked on the North lead, and Mr. Wadworth carried on operations at the Lake lode for some Americans by whom it had been purchased. A 5-stamp mill was in operation here.

In 1887 Robt. Wright raised good ore from some of the flat lodes in the vicinity of the old Heatherington property. The Lake Lode Company pushed operations on their property, opened a new shaft, and put in new machinery. This mine continued a steady production for several years. During the following year this company opened the Caffrey property.

In 1889, the Lake lode furnished plenty of ore, but the work at the Caffrey mine was chiefly of an exploratory character. On the Heatherington property a lode was opened by several pits and the construction of a crusher was commenced. In 1888, Messrs. Henry Archibald, Herbert Dixon, and Gordon Zwicker purchased seventeen areas west of the Touquoy and Caffrey properties, and during the next year underground work was pushed vigorously, a very promising lode was developed, and a 5-stamp mill erected. The returns from this, the Dixon property, for 1890 showed an average yield of over 1 ounce per ton. In 1890, returns were also made from the Lake lode and the Caffrey properties.

In 1891, the Dixon mine was being worked and operations continued here for several years, but the Lake lode and the Caffrey mines were idle,[1] although the former was kept pumped out.

In 1892, R. Wright and others did considerable prospecting, twenty men were employed at the Dixon mine, and George Stuart began to develop the Burkner lode. Stuart took charge of this mine in October for the Truro Gold Mines Company and, after testing it and finding good ore, put in new machinery.[2] He reported to his company a clean up of 750 ounces from 30 tons of quartz mined during November 1 to 17, and December 14 to 30. Work continued at this mine during a part of 1893, but ceased late in the year. Then it was sold to Mr. Stuart, and in 1899 was taken over by the Caribou Gold Mining Company, and work started again under the management of Stuart. This year the Caribou Gold Mining Company secured the Caffrey, Huntington, Dixon, Touquoy, Amherst, and Bruce properties, but according to the *Critic* of June 4, 1895, the property was said to be for sale again.

---

[1] Can. Min. Rev., Jan. and Aug., 1891.

[2] Can. Min. Man., 1893, p. 404.

In 1893, the old Lake lode was unwatered and retimbered by W. H. Saunders; work continued at the Dixon mine; R. Wright employed four men on the old Caffrey property; and E. C. McDonald and H. H. Anderson started a vertical shaft on the anticline. The next year the main shaft at the Dixon mine was continued to a depth of 230 feet and twenty-five men were employed, and W. H. Saunders had fourteen men at work at the Lake lode mine.

At the latter mine thirty-six men were employed in 1895, the shaft was down 160 feet vertically and 540 feet on an incline of 36 degrees, and all the machinery had been remodelled and a new 10-stamp mill erected. Eight men were employed on the Caffrey property, and R. McLeod had forty men at work at the Dixon mine, where the shaft had reached a depth of 300 feet. The Bell mine on the McDonald lead was unwatered and retimbered under the management of W. J. McIntosh, and a new 15-stamp mill was erected. Work continued the next year on the Lake lode, the Dixon and the McDonald mines, W. A. Saunders being manager at the first, A. McLeod at the second, and Patrick Carr at the third.

In 1897, the Lake lode mine was purchased by the Guffey-Jennings Gold Mining Company, Limited, and under the management of L. W. Getchell a new vertical shaft was started. Work was continued on this shaft the next year under the management of H. Guffey and a depth of 400 feet was reached. In 1897, the Elk Gold Mining Company had eighteen men employed in the northern part of the district under the management of F. Prince, but during the following year little was done. Under the management of Fred. Darragh, a little work was done about the mill and the pumps were kept going. A little work was being done at the Dixon mine in 1897 by W. J. Davison, manager, but the water had been permitted to rise within 90 feet of the surface.

The Truro mine was reopened in 1899 by W. J. Davison and a test lot of 100 tons taken out, and in 1900, Messrs. Sinclair and Logan unwatered the mine and took out a test lot of 30 tons. In 1899, Otto Collins had five men at work at the Elk mine and a little work was done here also during the following year.

Work was continued in 1899 at the Guffey-Jennings mine under the management of H. A. Guffey, the vertical shaft was sunk to a depth of 500 feet, levels were driven, a crosscut run to the north, and some new machinery put in. During the following year driving levels, crosscutting, and stoping were conducted under the management of W. J. Prisk.

This property passed into the hands of the Baltimore and Nova Scotia Mining Company and active operations were carried on here for several years. In 1901, L. W. Getchell was manager, and W. J. Prisk superintendent, fifty men were employed, and sinking, driving levels, and crosscutting and stoping were continued. A new 40-stamp mill, with 20 stamps on each side, back to back, was erected. During this year a cyanide plant with a capacity of 100 tons was erected on the Elk property to treat the old tailings, but in the autumn of the same year it was removed to Isaac Harbour.

The Baltimore and Nova Scotia Mining Company continued sinking, driving levels, and stoping in 1902 under the management of L. W. Getchell. The vertical shaft was sunk to a depth of 700 feet; details are given in the Report of the Department of Mines for Nova Scotia as to the extent of the work done. Sixty-two men were employed in 1903, and the ore-shoot pitching to the west was followed by means of levels and a winze sunk from the 700-foot level. During the next year about the same number of men were employed, a vertical depth of 1,000 feet was attained in this mine, stoping was active, and the crosscut at the 700-foot level was extended nearly 900 feet south. In January, 1905, work at the mine temporarily ceased while the government drill was employed in prospecting, but was resumed later.

A horizontal drill hole driven south from the face of the 912-foot crosscut intersected the following strata:

	Feet	Inches
Black slate	30	0
Black and grey slates	47	5
Grey slates	232	7
Black and grey slates mixed	92	0
Total	402	0

Another hole was drilled south from the 500-foot level at a point 554 feet west of the shaft and opposite the north crosscut, but apparently no ore-body was struck.

During 1906 and 1907, no work was done at this mine, but the water was kept down to the 700-foot level.

On June 10, 1906, work was commenced in what is known as the north shaft at the Dixon mine under the management of G. H. Lawlor, and 150 tons of quartz was taken out. During the next year 119 ounces of gold was extracted from 174 tons of quartz, but mining ceased at the end of March.

In 1908 a large part of Caribou district was purchased by Mrs. M. R. Holman and consolidated under the name The Caribou Gold Mines. Under the management of L. W. Getchell, extensive prospecting and development work was commenced at the Dixon, Truro, Lake, and Flat lodes and a new vertical shaft called the Holman shaft was started on the centre of the dome. At the Dixon mine some crosscutting was done; the Truro mine was unwatered, some retimbering done, the 130-foot level continued west 270 feet, and a small amount of ore stoped out; repairs were also made on the equipment. The 40-foot shaft, sunk a number of years previously on some flat leads, was unwatered, and retimbering was started. The shaft at the Lake lode was kept unwatered, the intention being to sink an incline shaft from the station at the 700-foot level, to follow along the lower limits of the pay-shoot. This incline had reached a depth of 90 feet by the end of September, 1909. In July, 1909, the surface equipment at this shaft was destroyed by fire, but rebuilding was at once commenced. Mining was carried on continuously this year on the flat lodes, and after the destruction of the mill at the Lake lode the ore was crushed by the Dixon 10-stamp mill, which was taken down and re-erected just north of the Holman shaft. Little was done during the year at the Holman shaft or on the Truro lode.

In 1910 levels were driven by the Caribou Gold Mines, Limited, from the new Flat leads shaft and considerable stoping done. Work on the Holman vertical shaft was recommenced in October, 1909, the shaft was continued to a depth of 100 feet, and levels were driven 50 feet east and 40 feet west on the Ross lead. At the east end of this drift a pocket of very rich ore was struck. In 1911 a small amount of ore was stoped on the Bob Wright angular at the Flat leads workings. There was much greater activity at the Holman shaft, the drift on the Ross lead was carried east 150 feet farther, and the greater part of the ore mined in this district during the year came from a stope on the Ross lead and a small lead on the foot-wall of the Ross lead belt. A crosscut south from the Holman shaft was carried to a total length of 200 feet. In 1912 the level on the Ross lead was carried east to a total length of 235 feet and west to a total length of 90 feet, the south crosscut was carried to a total length of 235 feet to the Mascot and Surprise leads, and a level driven east on these two leads 230 feet cutting the Bob Wright and No. 1 angulars. A winze was sunk on the No. 1 angular and raises made on both angulars, connecting with the old Flat leads workings. The ore milled was from the Ross, Mascot, and Surprise leads and the two angulars. In 1913 a level 170 feet long was driven west from the Holman shaft at a depth of 100 feet around the nose of the anticline. Stoping was done on the north leg of B and C veins on the 40-foot level and on the north and south legs of B and C veins on the 100-foot level. The production in 1910 was 273 ounces from 409 tons; in 1911, 850 ounces from 754 tons; in 1912, 948 ounces from 1,366 tons; and in 1913, 459 ounces from 687 tons. According to the report of the Nova Scotia Department of Mines work was apparently continued in 1914 on the Ross and Reliable leads, which are 3 feet apart. A vertical shaft was sunk on the apex of the dome to a depth of 149 feet and crosscuts were driven on the 100-foot level to the south 125 feet and to the north 249 feet. The vertical shaft revealed twenty-seven veins, many of which are gold bearing.

In 1913 the Dixon mine was unwatered by the Caribou Gold Mines, Limited, and about 75 feet of drifting was done on each of the 100-foot, 200-foot, and 300-foot levels. There was a small production in 1914, and in 1915 drifting and stoping were continued to the east of the east shaft which is 320 feet deep. The 60-foot level was driven 200 feet east, making a total length of 320 feet; the 140-foot level was driven east 100 feet, making a total length of 275 feet; and the 200-foot level was extended 50 feet, making a total length of 275 feet. Most of the ore was stoped. The main shaft, which is 357 feet deep, was unwatered to the 150-foot level. The 60-foot level was driven west 50 feet, making a total length of 175 feet west of the main shaft and the 150-foot level was driven west 30 feet, making a total length of 80 feet. Most of the ore between the levels, and nearly all the ground above the 150-foot level between the two shafts, has been stoped. A yield of 294 ounces was obtained from 322 tons of ore. Work on the Dixon fissure was discontinued in December, 1915.

In 1914 seven leads were discovered by surface prospecting east of the Holman mine and in 1915 a shaft was sunk by the Hilchey Mining Company on one of those leads known as the Hilchey lead. Work was continued in 1916 and 666 ounces were recovered from 33½ tons of ore. The shaft was sunk to a vertical depth of 14 feet and then followed the lead 80 feet on its dip of 45 degrees. Most of the ore was stoped to this depth for a distance of 80 feet west of the shaft and 115 feet east of the shaft. A small amount of work was done on this lead by the Caribou Gold Mining Company in 1916, on area 381, block 2, to the west of the property of the Hilchey Mining Company. In 1917 work was continued by H. F. Ross on this area. The shaft was carried vertically to a depth of 26 feet and then followed the vein on its dip of 45 degrees to about 100 feet. Ore was stoped 61 feet east of the shaft and 64 feet west from a 5-foot belt carrying a 6-inch lead on the hanging-wall and a 4-inch lead on the foot-wall. In 1918 the shaft was carried to a depth of 130 feet and stoping was continued to this depth 61 feet east to the eastern boundary of the property and to a distance of 80 feet west of the shaft. The production in 1917 was 188 ounces from 345 tons and in 1918, 281 ounces from 600 tons. In 1919 the 130-foot level was carried 130 feet farther west and stoping was carried 20 feet above this level. A fault was encountered at 200 feet from the shaft. Work was continued in 1920 and 137 ounces of gold was recovered from 305 tons of ore.

Messrs. Hall and Hilchey acquired the property of the Hilchey Mining Company and in 1920, 1921, and 1922 carried on a great deal of surface prospecting and tested several veins by means of pits and small shafts. In 1924 Bessie A. Hall continued the surface prospecting that had been carried on for the three preceding years. In 800 feet of surface work over 50 leads were cut and more than 20 of these carried visible gold.

Production of Caribou and Moose River

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1869	1,001	0	23	1,583		12	17
1870	613	11	2	755		16	6
1871	504	15	23	479	1	1	1
1872	209	15	0	368		11	9
1873	17	16	12	21		16	23
1874	368	10	23	333	1	2	3
1875	446	12	19	368	1	4	6
1876	717	4	10	542	1	6	11
1877	2,596	13	23	1,735	1	9	21
1878	1,026	12	16	929	1	2	2
1879	676	1	21	781		17	7
1880	823	5	19	824	1	0	0
1881	1,129	18	13	1,661		13	14
1882	588	6	11	1,601		7	8
1883	477	11	6	3,094		4	14

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1884	966	19	22	1,559		12	9
1885	1,335	14	11	2,239		11	9
1886	2,233	17	16	3,087		14	10
1887	1,861	9	22	2,689		13	20
1888	2,729	10	15	6,313		8	16
1889	1,906	1	10	7,338		5	4
1890	1,576	19	8	6,661		4	17
1891	1,486	14	21	5,489		5	1
1892	2,335	16	10	7,189		6	11
1893 (9 mos. ended Sept. 30)	1,549	15	5	4,701		7	14
1894	2,779	16	17	9,727		5	17
1895	3,189	11	1	11,565		5	12
1896	2,864	13	1	13,918		4	2
1897	2,781	13	19	9,324		5	23
1898	1,201	7	19	6,188		3	21
1899	954	13	4	13,116		1	16
1900	1,633	6	23	8,348		3	21
1901	2,341	5	6	6,893		6	19
1902	2,162	0	21	9,890		4	9
1903	3,653	3	8	11,961		6	3
1904	1,856	19	12	10,592		3	12
1905	1,319	1	10	13,998		1	21
1906	831	1	16	9,268		1	19
1907	638	8	3	4,458		2	21
1908	132	0	0	1,240		2	3
1908 (Moose River)	890	10	0	8,952		2	0
1909	284	6	0	1,055		5	9
1909 (Moose River)	1,079	6	0	9,479		2	7
1910	270	10	0	409		13	5
1910 (Moose River)	235	14	0	2,291		2	1
1911	850	4	18	754	1	2	13
1911 (Moose River)	245	5	1	651		7	13
1912	984	14	0	1,367		14	10
1912 (Moose River)	330	5	13	1,013		6	12
1913	459	5	17	687		13	9
1913 (Moose River)	86	0	0	325		5	7
1914	483	10	2	789		12	6
1914 (Moose River)	94	13	0	405		4	16
1915	293	18	0	322		18	6
1915 (Moose River)	64	18	0	276		4	17
1916	693	15	21	413	1	13	14
1916 (Moose River)	43	0	0	271		3	4
1917	200	5	20	365		10	23
1918	281	0	0	600		9	9
1919	296	0	1	818		7	6
1920	206	19	6	345		11	23
1921	74	4	20	40	1	17	3
1922	7	7	10	5	1	9	11
1924	69	0	0	15	4	12	0
1925	4	11	15	5		18	7
1926 (Moose River)	29	2	19	117		4	23
	60,077	9	1	233,594			

CARLETON[1]

Carleton district is situated near the village of Carleton in Yarmouth county, 16 miles northeast of Yarmouth and 5 miles from Brazil Lake station on the Dominion Atlantic railway.

The area is underlain by slates and quartzites of the Goldenville formation that have suffered a certain degree of metamorphism. Three parallel interbedded veins, the Carleton, Little, and Iron leads, occur within a distance of 145 feet in a block of strata thrown to the south between two faults converging toward the north. The Iron lead, the most northerly of the three, was exposed in a test pit 20 feet deep, but no ore was found. The Little or middle lead, which is 3 inches wide and whin-bound, was worked by open-cut for a length of 200 feet and to a depth not exceeding 30 feet. The Carleton lead was worked throughout its length of 315 feet between the faults by shafts carried to depths of 190, 100, 80, 80, and 30 feet, respectively, from east to west. The lead, which consisted of bluish mottled quartz carrying finely disseminated gold, calcite, arsenopyrite, pyrite, galena, and chalcopyrite, was 4 to 8 inches thick, but pinched out at the bottom of the workings except in the deepest shaft. Prospecting has been carried on to the east and west of the fault-block, but no ore of value has been discovered.[1]

---

[1] Plan published.

Gold[2] was discovered in this district early in the spring of 1886; in the summer a good vein was exposed and before the close of the year a small crusher was erected, to be run by water power; shafts were sunk about 100 feet; 300 feet of levels were driven and about 50 tons of rich ore taken out. It is reported that several tests showed a yield of 2½ ounces per ton. On this property,[3] which was sold by Messrs. Gale and Ross to Messrs. Hatfield and Uhlman, the shaft was sunk 100 feet deeper in 1887, and good ore was followed to the eastward. Some veins were prospected on the adjoining property by Messrs. Turner and Company, and about 700 feet north Messrs. Miller, Crosby, and Company opened a belt.

Production was reported for the years 1889, 1897, 1898, and 1899 and for these four years a total of 134 ounces of gold was obtained from 130 tons of ore. Production was also reported for 1901, 1903, 1904, 1910, and 1911, and 145 ounces of gold was obtained from 393 tons of ore. Trifling productions were reported for 1914 and 1915.

CENTRAL RAWDON

Location

Central Rawdon district is situated in the central part of Hants county, 5 or 6 miles east of Mosherville, a station on the Midland branch of the Dominion Atlantic railway, from which it is accessible by wagon road.

Geology

Rawdon hills, in Hants county, form part of a ridge composed of the most northerly zone of the slate division of the Gold-bearing series. This zone attains a width of 3 miles and has a general direction of north 65 degrees east (magnetic) and on the north side it is unconformably overlain by the Lower Carboniferous. The auriferous veins are situated three-fourths of a mile south of its northern limit and on the south limb of the McKay Settlement anticline. The rocks are traversed by numerous faults on the prolongation of an important line of disturbance, called the Major Lake fault, which has been traced across the country from Cole harbour on the Atlantic coast, a distance of 35 miles in a general direction of north 20 degrees west. The faults at Central Rawdon run more or less parallel and cut the slates almost at right angles, with a thrust and downthrow invariably to the north on the east side.

Character of the Deposits

There are three important veins, crossing the strata at about right angles to the strike: one known as the Cope lode, another in the immediate vicinity known as the West lode, and the third a fourth of a mile east of these known as the East lode The Cope lode, which averages 4 feet in width, strikes north 20 degrees west and dips east at an angle of 77 degrees; at a depth of 164 feet it dips at a lower angle, but soon resumes the original dip of 77 degrees. The lode known as the West lode lies on the west side and strikes south 11 degrees east. The two fissures in which the West lode and the Cope lode lie converge and from this junction run northward as one,

---

[1] Faribault, E. R.: Geol. Surv., Canada, Sum. Rept. 1919, pt. F, pp. 7-10.

[2] Rept. Dept. Mines, Nova Scotia, 1886, p. 19.

[3] Rept. Dept. Mines, Nova Scotia, 1887, p. 29.

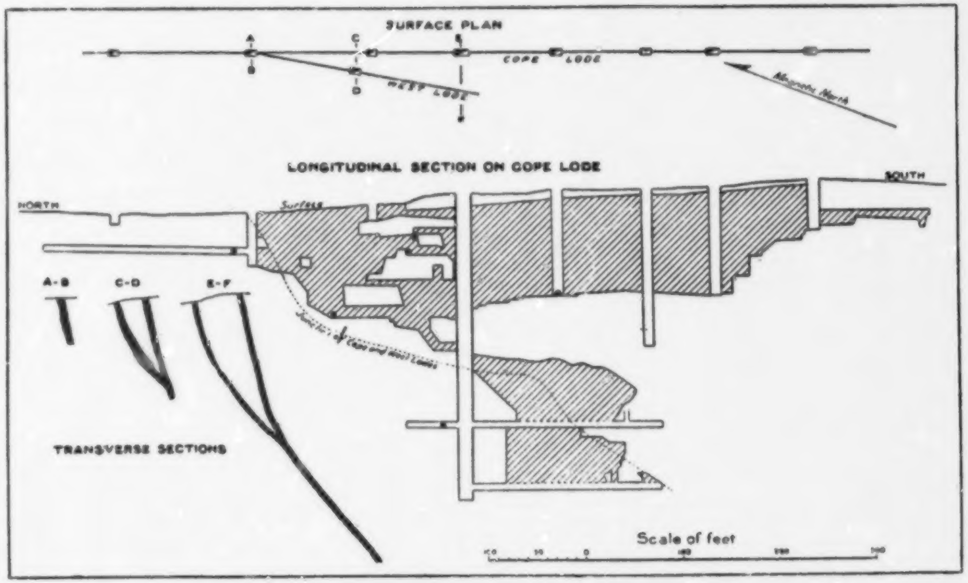
SURFACE PLAN
A
B
C
D
E
F
COPE LODE
WEST LODE
Magnetic North
LONGITUDINAL SECTION ON COPE LODE
NORTH
SOUTH
Surface
Junction of Cape and West Lodes
A-B
C-D
E-F
TRANSVERSE SECTIONS
Scale of feet
100
50
0
100
200
300

Figure 1. Workings on Cape and West lodes, Central Rawdon.

but the two veins remain separate, with broken slate between them, the Cope lode lying against the hanging-wall and the West lode against the foot-wall. The line of junction of the two fissures dips to the south at an angle of 32 degrees for at least 265 feet. The slickensiding and curving of the strata on each side of the Cope lode, and the strike of the strata forming the wedge lying between the Cope lode and the West lode, show that the displacement on the east side of the fissure had been towards the north and downward at an angle of 48 degrees, or that it is what is locally known as a left-hand fault. About the East lode less information is available. It also dips to the east at an angle of 68 degrees.

History

Central Rawdon is one of the later districts to attract attention, and during three years, 1888 to 1890 inclusive, a considerable amount of gold was produced.

Near the last of 1887 a company consisting of Clarence Dimock, Gould Northup, and others was formed to mine the Cope lode which had been discovered a short time previously by James Cope, an Indian. This company, known as the Northrup-Dimock Company, erected a 10-stamp mill in 1888 and began crushing in August. Work was carried on so energetically that before the end of the year 375 tons of ore was crushed, yielding 835 ounces of gold. The next year active operations continued and the remarkably satisfactory yield of 2,358 ounces from 925 tons was returned. The property passed into the hands of some Philadelphia capitalists, and Northup and his associates opened up a property east of the old workings on the East vein and erected a 15-stamp mill. In 1890 a good yield was reported from this district and several lots of surface material in addition to quartz were crushed at both mills. This year the Central Rawdon Mining Company, Limited, and the Northup Mining Company, Limited, were incorporated, the former to operate the mine on the East lode and the latter to operate the old Northup mine on the Cope and West veins, held for a short time by Philadelphia capitalists. Mr. C. E. Willis was manager for the Northup Mining Company and Mr. Gould Northup for the Central Rawdon Mining Company, Limited, and for 3 or 4 years small returns were made from the mill of the latter company.

In 1893 a 5-stamp mill was erected to crush ore from the Withrow property, about 1½ miles southeast of the Northup mine, and in 1894 a small amount of mining and milling was carried on here.

Returns were made by the Northup Gold Mining Company, in 1895, 1896, and 1897, and in 1897 the company had twenty-eight men employed under the management of E. C. Puttner. There were several shafts on the Cope vein, of which the deepest was over 400 feet. On the Central Rawdon property a tunnnel was driven this year in the hillside to cut the East vein and to explore the property and was carried to a length of 450 feet.

After this the district was comparatively idle until 1904 when work on the property was resumed by the Central Rawdon Consolidated Mines, Limited: Dr. Cain, manager. The extension of the tunnel was commenced in May and by the end of September the vein was reached at a distance of 926 feet from the mouth. The workings were unwatered, but little mining was done, and 13 ounces were reported in 1906 as a yield from 30 tons.

In 1923 the Central Mining and Development Company acquired the property. This company lengthened the drift on the East or Church vein. In drifting north they encountered what would appear to be a horse of slate almost completely filling a fault plane. A mill test upon the ore from the 200-foot level gave $9.50 per ton. In 1924 active mining operations were carried on. Drifts were made upon the Church lead 240 feet north and 160 feet south from the tunnel intersection. The horse of slate reported in 1923 was cut through and the lead returned to its normal size. There is evidence, however, that a similar occurrence is being met on the north drift. Some good ore was developed in the stopes on the south drift. One hundred and two tons of ore mined and crushed yielded 23 ounces gold.

General Development

There are five shafts on the Cope lode, the deepest of which was said to be 405 feet in 1897. These are connected by underground levels and the greatest amount of work was done on that portion of the Cope vein extending to the south of its junction with the West lode. Work in the East lode was not so extensive, but a shaft was sunk to a depth of 107 feet. In the tunnel driven in from the foot of the hill no new veins of value were struck, and little use seems to have been made subsequently of the tunnel.

Production of Rawdon (East and Central)

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1887	3,507	13	8	5,302		13	5½
1888	952	15	20	2,760		6	22
1889	2,358	10	0	925	2	10	23
1890	1,899	15	0	1,892	1	0	0
Central Rawdon							
1891	42	0	0	510		1	8
1896	531	13	0	769		13	23
1897	199	12	0	963		4	3
1917	5	10	0	100		1	2
1924	23	0	0	102		4	12
	9,520	9	4	13,323			

CLAM HARBOUR

Location

Clam Harbour is situated on Clam bay, on the Atlantic coast, in Halifax county, 47 miles east of the city of Halifax by post road.

Geology

The strata of the Goldenville formation here exposed are folded in two anticlines about 500 feet apart, running approximately east and west (magnetic), but slightly converging towards the west and both plunging to the east. At the eastern end of the district the strata between these two folds are plicated into two minor anticlines lying nearer to the south main anticline than to the north one. To the north of the north anticline and to the south of the south anticline the dip reaches at no great distance from the axis an angle of over 60 degrees. A small fault running at right angles to the strata crosses the district and gives a right hand horizontal displacement of some 90 feet at the south anticline, decreasing to only a few feet at the north anticline.

Character of the Deposits

Both classes of veins[1] are found here, the cross and the interstratified. The latter occur in slate belts lying between heavy beds of quartzite and on the crest of the main anticlines they dip to the east with the rocks and frequently show rolls which also dip to the east. These are the most persistent and most important veins and probably carry all the paying ore deposits. The cross veins, which cross the strata generally in a northeast direction, although probably carrying little gold in themselves, seem to serve as feeders to the other veins. Thus the ore-shoots worked down to 122 feet at No. 1 shaft, just north of the engine house, and the shoot worked to 60 feet, east of the forge, are formed by the intersection of a cross vein with interstratified veins. Further exploration may reveal the presence of other pay-shoots at the intersection of the two different kinds of leads.

Developments go to show that all the interstratified leads so far opened on the apex of the folds have proved auriferous, and this fact might well be taken into consideration by those contemplating further operations in this district.

---

[1] Faribault, E. R.: Geol. Surv., Canada, vol. XVI, p .330 A.

History and Development

The district has received scant attention from the mining or investing public. The greatest amount of prospecting done here was performed by P. Dunbrack, and mining operations were carried on by Mr. Foster. Several veins have been opened a few hundred feet along their strike and a few shafts have been sunk, but no very extensive operations carried on. Crushing was done in 1904 by means of an arrastre, which consisted of a large, circular granite stone revolving in a cast-iron pan.

COCHRANE HILL[1]

Location

Cochrane Hill gold district, including the Crows Nest mine, is situated in the northern part of Guysborough county a mile or two southeast of the confluence of the East and West branches of St. Mary river. It lies 10 miles north of the town of Sherbrooke and 30 miles south of Antigonish by the coach road.

Geology

Of the geology of this district, Faribault writes:[2] "This fold is the sharpest one known in the province and is much inverted to the south, the north limb dipping north 60 degrees while the south limb is overturned and dips north 75 degrees. The axis plane of the fold should thus dip northerly at an angle of 68 degrees.

The general course of the anticline at the surface is south 82° 45′ east (magnetic) and it pitches west at an angle of about 15 degrees or 20 degrees.

At the Crows Nest mine the anticline was located at a bluff of rock situated immediately east of the mine's road, and half-way between the mill and the manager's house, on area 916, block 75. It was traced eastward, up a steep cliff, across Cochrane hill and the main coach road, to Cochrane Hill mine, where it passes at the south corner of the quartz mill and is well exposed 400 feet farther on area 486, block 77.

The rocks brought up by the upheaval are the quartzose-sandstones and slates of the lower division of the Gold-bearing series. The rocks have been subjected to such great pressure that they have become highly schistose and crystalline, holding fine crystals of staurolite andalusite, garnet, and mica. The cleavage is highly developed, while the bedding plane is almost completely obliterated, and consequently, the structure of the anticlinal fold is very difficult to make out."

The sediments in the vicinity are penetrated by numerous granite dykes, varying from 6 feet to less than 1 inch in thickness. Some of these have been observed cutting the veins in the workings of the Belt lead. These granite intrusions have, doubtless, contributed much towards the alteration of the sediments and the metamorphism is equal to any observed elsewhere in the coastal series, producing rocks indistinguishable from those of Cape Canso peninsula and of Shelburne and Barrington.

Character of the Deposits

All the Gold-bearing veins operated at both mines follow the planes of stratification. Those that have proved productive lie on the south side of the anticline, at a distance from the axis of 200 feet at Crows Nest mine and 350 feet at Cochrane Hill mine, and all dip to the north at high angles. The Crows Nest mine, the Stake, Ross, and Belt leads, are the most important and lie within a width of 60 feet; at Cochrane Hill mine the most attention had been directed to the Ross belt, carrying five veins 1 inch to 4 inches thick, and the Mitchell belt, a large, low-grade deposit 75 feet wide with numerous interbedded veins 2 inches to 12 inches thick.

The pay-shoots dip westerly parallel with the plunge of the anticline and it is thought that they may occur in the different adjacent veins, towards the north, in a plane parallel to the axial plane of the fold, which dips north 68 degrees. In such case the shoot in any one vein would be found below and to the north of the shoot in the vein immediately to the south. At the Crows Nest mine the pay-shoots on the Stake and Belt leads were found to dip west at an angle of 15 degrees to 20 degrees.

In addition to these main veins[3] a few quartz veins holding mica are also met with, especially at the Crows Nest mine, but they generally follow the cleavage plane and invariably cut the bedded veins when they meet. Quartz mined from one of these at the Crows Nest mine is reported to have yielded a little gold, but it is possible that the gold came from the encasing slate belt which holds also an auriferous vein, the Belt lead. These micaceous veins are offshoots from granitic dykes occurring in the vicinity and of later origin than the auriferous bedded veins. Regarding the relation of the 'granite veins' and the quartz veins Sir J. W. Dawson says it would seem that the quartz veins cut or disturb those of granite and hence are newer, although there is some reason to believe that all the gold veins are not precisely of one date. From the relations determined in this field and from the fact that 'the gold deposits seem richer in the vicinity of the granite' Dawson feels justified in affirming that the granite intrusions and gold veins are 'roughly contemporaneous.' Faribault, however, claims that recent developments in this district have not borne out Lawson's conclusions. The district is probably one of the best for the study of the relations existing between the granite intrusions and the auriferous veins.

---

[1] Plan published.

[2] Geol. Surv., Canada, Ann. Rept., vol. XV, pt. A, p. 413.

[3] Faribault, E. R.: Geol. Surv., Canada, Ann. Rept., vol. XV, pt. A, p. 413.

History

This district, although one of the oldest in the province, has never ranked as an important producer. Some large bodies of low-grade ore are to be found here, but mining has generally been of a very intermittent and desultory nature.

Explorations[1] were made at Cochrane Hill in 1868, several lodes were discovered, and a shaft was sunk by Messrs. Cumminger and others. In 1869, a number of lodes were being opened by the Cochrane Hill Company, Kirk and Company, and Mr. McDonald, and a 15-stamp mill, to be run by waterpower, was erected at Melrose about 2½ miles northwest. After this, little work other than prospecting was done for a number of years. In 1877, 118 tons of ore was crushed, yielding 48 ounces, and for a few years Mr. Cumminger and some others did intermittent work. In the nineties work was carried on at different times under the management of such men as A. H. McQuarrie, H. E. Taylor, and H. Hopping. The mine then lay idle for some time, but in recent years it has been held by the California Gold Mining Company. During this time it has been idle a great deal, but has been worked occasionally under the management of G. F. McNaughton. In 1907, 560 tons of quartz was crushed yielding 113 ounces, and early in that year operations ceased and the mine was allowed to fill.

Work at Crows Nest did not start so early as at Cochrane Hill, but in 1878 some leads were opened which yielded a pennyweight or two of gold. It seems that little or nothing was done then for several years, but Mr. Fraser did some development work in 1885 and 1886, and work continued here intermittently for ten years. After this, work was carried on for five or six years under the management of W. H. Weston.

The veins on which the geatest amount of work has been done are the Mitchell belt at Cochrane Hill and the Stake and Belt leads at Crows Nest. The work consists of open-cuts and underground mining. At Crows Nest the hill is 200 feet high and the deposits were worked by means of adits. A 20-stamp mill and two Wilfley tables were operated at Cochrane Hill and a 20-stamp mill and one Wilfley table at Crows Nest.

Preparations were made in 1926 for carrying on mining. In 1927 the Novamac Mines and Power Corporation, Limited, erected a 10-stamp mill, deepened the shaft on the Mitchell belt 100 feet, making a total depth of 220 feet, and by the end of the year had completed 100 feet of drifting and 50 feet of crosscutting to the south. A yield of 152 ounces of gold was obtained from 962 tons of ore. Work was discontinued in this district, the company concentrating its efforts on operations at Goldenville.

General Development

At neither mine has any considerable depth been reached. At Cochrane Hill mine the greatest depth attained up to 1902 was 125 feet on the Ross lead, and surface developments had extended throughout a length of 1,800 feet. Further development has been carried on since then, and in 1906 the shaft was deepened to 225 feet and levels and crosscuts were driven. At Crows Nest mine work was carried to a depth of 100 feet and throughout a length of 850 feet. The pay-shoots in the Stake and Belt leads were worked to a fault running southeast, but their continuation on the opposite side of the break was not discovered.

---

[1] Rept. Chief Commissioner of Mines, Nova Scotia, 1868, p. 37.

The present developments indicate that the relative position of the gold-bearing leads with reference to the anticline is the same at both mines, that the zone of auriferous veins runs nearly parallel with the anticline, at a distance of 200 feet at Crows Nest mine and 300 feet at Cochrane Hill mine, to the south of the axis, and that systematic developments along this zone between the two mines will probably uncover new gold-bearing veins.

The production of this district is included in that of Sherbrooke.

COUNTRY HARBOUR

Location

Country Harbour gold district is situated in the central part of Guysborough county on Country Harbour river and its tributary, Johnson brook. It lies 5 miles south of Country Harbour cross-roads and is reached by coach running from Antigonish on the Canadian National railway to Isaac Harbour.

Geology

The Goldenville formation is here exposed and the district lies between a large granite mass on the east and a smaller granite mass to the west, while a short distance to the south and southwest are other large granite masses. The sediments themselves are much intersected by dykes given off from the granitic intrusions. A peculiar feature of the sediments of this district is their general north and south strike, the strata at the Narrows running north 10 degrees west, and those up Johnson brook a little east of north The anticline has been located with certainty at two points, namely, at the northwest side of area 1064, where a ledge of quartzite crops out prominently on the northwest side of a small brook, and at the south corner of area 1340, about 200 feet directly west of the Morrison shaft. At both places the anticline shows a decided pitch to the south and on area 1340 a quartz vein can be traced around the apex. Immediately east of the axis the rocks are concealed, but farther east they dip east at a low angle; on the west side they make an abrupt curve and assume a steep dip to the west. This block of gold-bearing rocks is believed to be a part of the Cochrane Hill and Forest Hill anticline, which has been swung through an angle of 90 degrees by the forces that produced the great fault along Country harbour.

Character of the Deposit

All the veins worked in this district lie in stratification planes, have a general north and south direction, and dip to the west. As the anticline has a pitch to the south the strata and veins approach the apex of the anticline towards the south until they eventually curve around it and assume an easterly dip. The quartz vein that curves around the apex of the fold on area 1,340 carries rolls dipping to the south at an angle of 15 degrees. The pay-shoots dip south and the shoots of the different veins will probably outcrop along a line approximately parallel with the anticlinal axis.

Among the most important deposits are the Mason belt and the Prince lode up Johnson brook and the Fraser belt immediately east of the river at the Narrows. The last-named is about 5 feet wide and contains three veins: the bull lead on the foot-wall, the 15-inch lead running through the belt, and a small, whin-bound lead on the hanging-wall. It strikes north 10 degrees west and dips west 58 degrees. The ore-shoot on the Mason belt dipped south about 5 degrees, was cut off by a granite dyke, but was not found beyond it. Several other veins have been opened by test pits. Rich drift has been found at different places up Johnson brook, but the thickness of the drift and the abundance of faults and granite dykes render prospecting very difficult. All the veins except those in the vicinity of the main river fault do not seem to be much displaced by the intersecting granite dykes, nor does the richness of the pay-shoots appear to be affected.

History

The discovery[1] that led to this district being proclaimed is attributed to J. Fraser and was made in September, 1861. Nothing was done except a little prospecting until 1868, when a small crusher was built. During the next four or five years a number of lodes were opened and worked intermittently on a small scale. In 1889 some work was done on Johnson brook and a rich discovery was reported.

Activity was greatest in this district during the nineties, and operations were carried on chiefly on the Mason belt and the Prince lode, the former of which proved quite productive. The two companies that did the most work were the Country Harbour Gold Mining Company and the Antigonish Gold Mining Company. The latter company, under the management of J. C. McDonald, worked the Copeland mine until 1895 and operated a 15-stamp mill. The Country Harbour Gold Mining Company worked rather intermittently on the Prince lead. In 1897 some work was being done by the Hopewell Mining Company under the management of J. E. Mason. A few years later the properties of the Country Harbour Gold Mining Company, and the Antigonish Gold Mining Company passed into the hands of A. C. Blair and others of St. John and some work was done under the management of Alex. Cameron, but at the time of the inspector's visit in August, 1902, the mines had closed.

Work has been done at different times at the Narrows on the Fraser and other adjacent leads. In 1909, the Sydney Gold Mining Company had twenty-two men employed under M. Shannahan in the McDonald shaft on the Fraser belt, and 455 ounces of gold was recovered from 510 tons of ore. The shaft was sunk 65 feet so that it now has a depth of 145 feet, and drifting was done on the 40-foot and 80-foot levels. Twenty-eight tons of ore was crushed by this company in 1911, and in 1912, 68 ounces of gold was obtained from 250 tons of ore.

General Development

There is little information available on the extent of development work performed in this district. The productive veins lie on the west limb of the anticline and it may be that there is a zone of special enrichment parallel to the axial plane of the anticline. If such be the case then surface explorations on the west side of, and parallel with, the anticlinal axis may reveal other pay-shoots, and as the axial plane dips east the rich portions of unexposed veins may possibly be found at a lower depth and to the east of those already exploited. Regarding these matters, however, one cannot speak with certainty.

The production of this district is included under the production for Stormont, to be found in the description of Isaac Harbour.

COW BAY

Location

Cow Bay mines are situated on the east side of Halifax harbour on the main road to Cow Bay beach.

Geology

Through this locality runs the line of contact between the Halifax and Goldenville formations and the beds dip to the south at angles varying from 35 degrees to 40 degrees. At the contact lies a belt of grey argillaceous quartzite about 100 feet wide, of which some layers are heavily charged with pyrrhotite.

Character of the Deposit

A great number of veins have been opened crossing the line of contact of the two formations throughout a length of nearly 4 miles, across the peninsula lying between Cole harbour and Halifax harbour. All run north and south, cutting the strata at right angles and dipping vertically. They have been shown to be richest in those portions where they cut the pyrrhotite-bearing belt of rocks, and as those dip to the south at an angle of 35 degrees the problem of keeping in touch with the pay-shoots should present few difficulties. The vein that has received most attention is that once worked by the Evangeline Gold Mining Company, Limited. It varies much in width, but averages 12 inches, and the productive part, which dips to the south at the same angle as the strata, is said to be 35 feet broad. At 78 feet from the surface in the north shaft a level has been driven to the north 47 feet to a 10-foot belt of hard slate, where the vein turns to the west and decreases in size.

---

[1] Heatherington, A.: "Guide to the Gold Fields of Nova Scotia," p. 62.

History

The account of the early history of this district is based almost wholly on information got from an article by F. P. Ronnan in the Industrial Advocate, January, 1900 (Halifax). This ground had received some attention from prospectors, and in August, 1895, D. M. Thompson of Musquodoboit discovered a boulder carrying gold. After considerable trenching he exposed in November a cross vein which was identified as the source of the boulder. This appeared to Mr. Thompson so promising that in the winter of 1895-6 he erected a 5-stamp waterpower mill on Cow Bay river about a fourth of a mile south of his mine. The undertaking seems to have been justified, for from June to December, inclusive, 1896, this crusher recovered 324 ounces of gold from 326 tons of quartz.

Thompson's success drew the attention of a number of mining men, and three or four veins were opened up by Messrs. Griswold, Marvin, Noonan, and others. In 1897, a considerable amount of gold was recovered. During this year a number of the properties changed hands. The Griswold areas were sold to Miner T. Foster and the property became known as the Tecumseh. The Marvin and Noonan prospect was sold to Messrs. A. A. Hayward, H. Cooper, and Jack and Bell, and a little development work was done. The Thompson areas and mill passed into the control of Halifax capitalists under the name of the Cow Bay Gold Mining Company. Some mining was done here in 1897, but the property was leased in January, 1898, to Charles Putman and Capt. Laurence, who undertook to continue development work. Soon the mine was closed and the district lapsed into a period of idleness. About the middle of 1899 the property of the Cow Bay Gold Mining Company was sold by the sheriff to I. W. Horn, who set to work reopening the mine.

Mr. Horn with twelve men continued work here in 1900 for the Evangeline Gold Mining Company, Limited. The next year the company was reorganized, L. Holland was made manager, and efforts were directed towards following the pay-shoot. Work seems to have been discontinued late in 1901 or early in 1902, and little was done until late in 1904 when work was resumed at the Evangeline mine. In 1905 the Cow Bay Syndicate reported a production of 127 ounces from 112 tons, but since then little work has been done here, except in the way of prospecting and testing.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1896	240	4	12	178	1	6	23
1897	560	19	19	717		15	15

CRANBERRY HEAD

The mine known as the Cream Pot is near the shore at Cranberry head about 5 miles north of Chegoggin in Yarmouth county.

Only one vein[1] has been worked. It is composed of quartz carrying arsenopyrite, galena, and free gold and is in the form of lenses generally 4 to 8 inches thick and 1 to 3 feet long. It strikes 50 degrees east magnetic and dips south at an angle of 59 degrees, thus cutting across the slates of the Halifax formation which strike 44 degrees east and dip south at an angle of 80 degrees. It outcrops on the shore at low tide.

---

[1] Faribault, E. R.: Geol. Surv., Canada, Sum. Rept. 1919, pt. F, pp. 18-20.

A discovery was reported in 1868 and the vein appeared so promising that considerable work was done in 1869 and in the early seventies. In 1869, an open-cut 600 feet long and 20 feet deep was made and 2 shafts were sunk; in 1870, the shafts were deepened, stoping was done, and 130 ounces of gold recovered from 184 tons of quartz; in 1871 little was done and operations soon ceased, for we learn that in 1874 the mine was reopened. [1]In 1874, the west shaft had attained a depth of 190 feet and the east one a depth of 145 feet, and two others on the vein had a depth of 90 feet and 40 feet respectively. The ground between the first and second shafts had been stoped to within 50 feet of the surface. During the winter of 1874-5, 38 tons of quartz was crushed, yielding 29 ounces, and then operations ceased. Operations were carried on in 1880 and 1881, the shafts were deepened and considerable ore stoped. In 1897 new machinery was erected and the mine was reopened and worked for two or three years.

Faribault reported in 1919 that the mine workings consisted of three shafts, the west or Bank shaft 160 feet deep, the middle shaft 200 feet deep, and the east or Pump shaft 220 feet deep. The west and middle shafts are 90 feet apart and the middle and east shafts 50 feet apart. The ore between the shafts had been stoped, and stopes extended 118 feet west of the west shaft and 100 feet east of the east shaft. A shaft, the Huntingdon, 295 feet east of the east shaft, had also been sunk to a depth of 90 feet and short drifts run, and 100 feet farther east a shaft, the Ryerson, had been sunk to a depth of 30 feet.

EAST RAWDON

Location

East Rawdon gold district is situated near the central part of Hants county and is a few miles' drive by wagon road from either Clarkville or Kennetcook station on the Midland branch of the Dominion Atlantic railway running from Windsor to Truro.

Geology

The Goldenville formation here forms a broad anticline with axis running northeast and southwest and plunging to the northeast. The strata on the south limb dip south at angles varying from 30 degrees to 45 degrees and those on the north limb dip north 40 degrees to 55 degrees.

Character of the Deposit

The veins follow the stratification planes. They occur on the north limb and have the comparatively low dip corresponding with that of the strata. Towards the east these veins curve towards the apex of the anticline and flatten somewhat. The following leads are crossed as one goes northward from the anticline: Mill (6 inches), Big (36 inches), Richardson (5 inches), Barn (8 inches), No. 1 (7 inches), North (2 veins, 30 inches), Mason McIntosh, and five leads cut in a crosscut driven to the north.

The veins that have proved most productive lie 600 or 700 feet to the north of the anticline, and well-defined rolls occur on some, dipping to the east. Operations have been practically limited to the McIntosh, North, and No. 1 leads and the last is by far the most important one in the district. In this vein the ore occurs in a series of parallel pay-shoots pitching east and separated by barren quartz, and in a shaft 510 feet deep seven different pay-shoots were met.

History

It was not until late in the history of gold mining in the province that this district received any attention, and although good results were obtained occasionally, there never has been any great measure of development.

The first time it is mentioned in the Reports of the Department of Mines is in 1884, when Messrs. Sims and White opened a lead 4 to 7 inches thick and a belt carrying several leads from 15 to 25 inches thick. A 10-stamp mill was erected and 241 ounces of gold extracted from 217 tons of ore. In 1885 the Sims or No. 1 lead was opened over a length of 900 feet by Robert McNaughton, and the returns show a yield of 2,750 ounces from 1,173 tons. Some development work was also carried on during this year by Messrs. Thompson, Anderson, and Lants. In 1886, two mines were worked steadily, the west under the management of Mr. Dissoway and the east under the management of Mr. McNaughton. In 1887 both mines continued producing gold and the workings on the McNaughton mine were carried to a depth of 400 feet on a wide lead giving 4 feet of ore. The district ranked first among the pro- ducers of the province, and 3,507 ounces of gold was recovered from 5,305 tons of ore. This year both properties were sold to the Rawdon United Mining Company and operations were continued under the management of Captain Nicolls until August, when all the buildings connected with the mining industry in this locality were destroyed by fire. In 1890, Barres and McNaughton reported 257 ounces of gold and the following year a small amount was reported, but except for a few ounces in 1908 no returns have since been made. In 1901 the McNaughton mine was unwatered by the Gold Zone Mining Company and it was the intention of the company to remodel the 25-stamp mill and start mining, but the prospects were apparently not satisfactory.

---

[1] Rept. Dept. Mines, Nova Scotia, 1874, p. 48.

General Development

By far the greatest amount of work was done on the No. 1 or Sims lead, and from the west end to the east in a length of 2,000 feet shafts have been sunk to the following depths: 45 feet, 30 feet, 500 feet, 510 feet, 360 feet, 90 feet, 90 feet, 200 feet, 260 feet, 410 feet, 400 feet, and 25 feet. On the north lead, lying a short distance north of No. 1, one shaft was sunk 190 feet and a few others to shallow depths. On the McIntosh, the only other lead that has been mined, shafts have been sunk on the east and to depths of 30, 45, 70, 100, and 30 feet from the west to the east, while at the west end a shaft was sunk 70 feet deep. From this shaft a crosscut driven 270 feet north intersected five leads, and one driven south 20 feet intersected one lead. None of these has been opened. The operátions on the other leads of the district consist chiefly of prospecting pits.

The production of this district is included with that of Central Rawdon.

ECUM SECUM

Location

Ecum Secum gold mines are situated in the extreme eastern end of Halifax county, a short distance west of the mouth of Ecum Secum river. Access is obtained either by packet steamer running from Halifax to Port Dufferin or by stage from Shubenacadie station, a distance of 70 miles, to Port Dufferin and thence by post road, a distance of 19 miles.

Geology

The north limb of the Tangier-Harrigan Cove anticline has at this place been folded into several subordinate crumples. In the developed portion of this district an anticline at the north and a syncline at the south lie 500 feet apart, with two minor intervening undulations. The syncline plunges east 17 degrees.

Character of the Deposit

The two classes of veins are represented in this district and both have been worked more or less extensively. The two leads that have attracted the most attention are the Cameron and Galena leads. The former is interbedded and carries a vein on each wall. It lies on the south limb of one of the minor folds, and, where an incline shaft was sunk on it, its depth to the syncline is 170 feet. On this lead a great portion of the leg on the south dip has been found auriferous, especially on the curved part near the surface, but that portion of the vein on the anticline immediately to the south, although in thick rolls, does not seem to carry pay ore. At the surface the hanging-wall vein is 6 inches thick and the foot-wall vein is 4 inches. These pinch out at a depth of 130, but come in again on approaching the syncline and show rolls as high as 24 inches, and 10 inches, in thickness, respectively. These were auriferous and were worked on the eastern pitch for a length of over 250 feet.

The Galena vein is a cross vein lying in the trough of the southern syncline with whose axial plane it is coincident. It is 7 inches thick, has gouge on both sides, and carries galena and other sulphides.

Another vein that has received some attention is the Pittsburg. Several leads are exposed to the north of the workings on the Cameron both on the surface and in the crosscut driven to the north. A number of veins were also cut in the vertical 121-foot shaft sunk near the local anticline just north of the Galena vein.

Three-fourths of a mile west six leads have been cut. One with a 35-foot shaft is 42 inches thick and dips south 60 degrees; another 12 feet south has 22 inches of quartz, and another belt carries four veins 2 inches to 4 inches thick. The rolls here dip east 20 degrees.

On the east side of Ecum Secum inlet a 12-inch vein with rolls dipping west 5 degrees attracted some attention, but no extensive mining was done.

History

A discovery was reported from this district in 1868, but it was not until in the eighties that mining operations were carried on to any considerable extent.

A great deal of gold was found in the surface boulders during the prospecting in 1868, and in 1869 the Atlantic Company erected a small crusher and did a small amount of mining, which seems not to have proved remunerative. After this some prospecting was done, in 1877 a small lot of quartz was crushed at Tangier, and in 1879 a small lot at Goldenville. In 1880 and 1881 the Pittsburg Company got out some quartz from the property once held by the Atlantic Company. A little mining and considerable prospecting were done in 1889, and again in 1892 an 8-stamp mill was running. In 1894 two shafts were sunk at the Ecum Secum mine by Malcolm Cameron.

In 1899, the property was held by the Westminster Gold Mining Company, C. H. Drillio, manager. In December of this year John E. Hardman reported on the property. He considered the plant of little value. Most of the work had up to this time been done on the Cameron lead. From the old workings 900 tons of quartz had been mined and milled, and this, together with 200 tons taken from veins farther south, had, according to sworn evidence, yielded 11 pennyweights per ton. Hardman recommended a thorough system of development, and in 1900, with Fergus Donovan as manager and C. H. Drillio as foreman, crosscuts were run north and south from the inclined shaft on the Cameron lead, cutting the Galena lead and others, levels were driven on the Cameron and Galena leads, and a vertical shaft was sunk. In 1902, this mine was in the hands of the Donovan Mining Company, G. H. Gillespie, manager, and C. H. Drillio, foreman. At the time of the inspector's visit the work was confined chiefly to the surface and preparations were being made for putting in machinery. In 1903, this company sank the vertical shaft still deeper and drove levels on the Galena vein. Later the mine was closed, but was opened again in August, 1906, by the Ecum Secum Gold Field, Limited, G. H. Gillespie, manager, and from September 1 to June 19, 1907, when operations ceased, 456 tons of ore was crushed, yielding 339 ounces of gold. A 10-stamp mill was used.

Some work has been done on a vein on the east side of the harbour near the water. The discovery of this vein is attributed to G. C. Armstrong. Some sinking and drifting were done on this vein in 1902 and a 5-stamp mill was erected.

General Development

The Cameron lead was worked chiefly by means of an incline shaft sunk on the lead. From the bottom of this 170-foot shaft a crosscut was driven north 186 feet and south 102 feet, the former cutting several interbedded veins and the latter cutting a small anticline, on which the quartz veins of the Cameron lead thicken and form rolls; then farther south a small quartz vein folded in the syncline was cut and at the axis of the syncline the vertical Galena vein.

On the Galena vein extensive operations were conducted and from the crosscut a level had been driven in 1904; east over 450 feet and west 320 feet. A second crosscut was run to this vein from the Cameron lead 250 feet east of the shaft.

A vertical shaft sunk 232 feet deep near the anticline to cut the Cameron lead intersected several quartz veins and at 120 feet struck the crosscut from the Cameron lead. The numerous veins cut were found to vary from a few inches to 3 feet in thickness and some of them were corrugated.

A shaft on the Pittsburg lead was sunk 218 feet east of the vertical shaft and 88 feet south of the cropping of the Cameron lead. This 2-foot lead was found to dip vertically in the shaft, but at a depth of 64 feet it turned in a syncline and came up the shaft so that the two legs of the vein were only 5 feet apart at a depth of 15 feet.

ELMSDALE

Mining has been carried on to a limited extent on Keyes brook in Halifax county, 2 miles east of Elmsdale station, on the Canadian National railway. The veins are found on the north border of the Gold-bearing series in the Goldenville formation. The strata dip south at an angle of about 40 degrees. A number of veins have been prospected, and some sinking and stoping have been done. On one vein two shafts were sunk, one 65 feet and the other 50 feet, and part of a pay-streak dipping west was stoped. The crusher[1] was run by waterpower.

FIFTEENMILE BROOK

Fifteenmile brook is situated in the eastern part of Queens county on the Liverpool-Caledonia road, 4 miles north of Middlefield.

The veins lie on the north limb of an anticline in grey slate with which are found a few beds of quartzite. Although rich drift has been found on the east side of the road the mining done so far is on the west side. Two leads especially have received some attention. The Pitblado lead is of the interstratified type, strikes 63 degrees (magnetic) and dips north 83 degrees. About 250 feet south of this is the Lowe vein, 4 inches wide, striking 76 degrees and dipping south. This is a cross vein, but it has a rolled structure, the rolls, however, not carrying gold.

The discovery reported from Middlefield in 1880 is probably that of the quartz veins at Fifteenmile brook. A little prospecting was carried on in the eighties and nineties. In 1901, a shaft was sunk and levels were driven on the Lowe vein; in 1902 a 5-stamp mill was erected and in 1906 C. N. Crowe worked about 2 months, taking out 240 tons, which yielded 54 ounces. A shaft has been sunk 140 feet deep and levels driven. The Pitblado vein has been traced 100 feet on the surface and a 30-foot shaft has been sunk.

In 1910 the Lowe mine on the fissure vein was unwatered and the 75-foot level carried east 140 feet to a total length of 260 feet. In 1912 a raise was made to the surface from the east end of this level and the 75-foot level was extended east 100 feet. In 1910, 92 ounces of gold was obtained from 530 tons of ore; in 1911, 25 ounces from 250 tons; and in 1912, 21 ounces from 225 tons. In 1914 a yield of 45 ounces was obtained from 120 tons. The east shaft had been carried to a depth of 220 feet, the 75-foot level to a total length of 120 feet east, the 120-foot level to a total length of 170 feet east and 145 feet west, and the 200-foot level to a total length of 200 feet east and 160 feet west. A vertical section of the mine is published in the Annual Report of the Mines (Nova Scotia) 1914.

---

[1] The Critic, July 19, 1889.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1910	92	3	0	530		3	11
1911	25	15	0	250		2	1
1912	21	1	5	225		1	21
1913	304	18	3	783		7	19
1914	44	15	18	120		7	11
	488	13	2	1,908			

FIFTEENMILE STREAM[1]

Location

Fifteenmile Stream gold district lies in the eastern end of Halifax county on a branch of East river, Sheet harbour. It is 32 miles from Hopewell, a station on the Canadian National railway between Truro and New Glasgow, and from this station there is a good wagon road as far as Trafalgar, from which place a passable road leads to the mines, 14 miles distant. It is only 15 miles north of East river, Sheet harbour, from which a good road runs in half the distance.

Geology

The plan of the district was published in 1889, and, although later investigations by E. R. Fairbault have shown that it is not accurate in every detail, his description of the structure as then known requires little alteration.

"The north anticline[2] of the Moose River mine passes through this district and is here composed of three minor anticlinal folds. The two most northerly folds are only 130 feet apart at the end of the district, on the New Egerton property, and have a pitch to the east at an angle of 30 degrees. The northernmost is well exposed at the west end of the district, on the east shore of Sheet Harbour river, 100 feet south of the free claim lead, where the pitch is to the west at an angle of 18 degrees, but the middle fold could not be located here as the bedrock does not crop out immediately south of the free claim mine. The east and west pitches of the north anticline meet and form a dome a short distance west of the Hudson property, where good ground is most likely to be found.

The southern anticline is well exposed at the west end of the district on area 905, block 2, 750 feet south of the free claim lead, also on the Sheet Harbour Portage road on area 858, block 4. Farther east it passes about 50 feet north of the Halliday lead, beyond which it is thrown to the north, about 150 feet, by a fault, and passes north of the McCuaig lead and south of the Hudson and White leads, prospected here on the eastern pitch of the anticline."

Regarding this southern anticline Fairbault reports to the Egerton Syndicate in 1902 that this anticline, if it exists, lies probably a little farther south, at the east end of the district, than is indicated on the published plan. His survey of the old workings of this company in the same year shows that in this most important part of the district there are three anticlines instead of two, as shown on the published plan, that the third lies between the North Serpent workings and the Island and Old Egerton workings. It was discovered in the crosscut driven 32 feet from the North Serpent workings, half-way between the east and west shafts at the depth of 45 feet. The anticline is met here at a distance of 17 feet from the foot of the wall of the Serpent lead, where a lead ¼ inch wide curves in the shape of a saddle. These later investigations have thrown some doubt on the existence of a cross fault east of the Walton Doran lead.

---

[1] Plan published.

[2] Geol. Surv., Canada, vol. X, pt. A, p. 110.

Character of the Deposit

The veins are of the interbedded class and lie in slate beds with whin walls. Nearly all the operations have been limited to veins on the north anticline or northerly groups of anticlines at the east end of the district.

In the eastern end of the district the pay-shoots follow the general rule and dip east with the plunge of the folds. Those with pay-shoots dipping to the east are the Old Egerton, McPhee, McGilligan, Island, Serpent, McLean, Walton-Doran, and Jackson. All these except the Jackson were worked on the eastern plunge of three anticlines. The Serpent was small but very rich in the southern syncline. The Orient, Nonpareil, Mother Seigel, and Harvey belts are a group of large belts on the south limb of the southern anticline. These carry rolls and swells dipping west at a low angle produced by numerous angulars striking about the same as the belts. Details regarding the character of all the leads are not available.

The Mother Seigel[1] at the main shaft is 10 to 38 inches thick; and at the face of the west level at the depth of 200 feet, in 1897, there was a body of ore consisting of 3 feet 3 inches solid quartz, 5 feet 5 inches of quartz and slate, and 2 feet 4 inches of slate. The greater part of the ore from this lead appears to have been derived from a very rich roll or swell cropping at the east shaft and dipping west, an exception to the general direction in which the rolls dip in this district.

The Nonpareil is a 10-foot belt carrying several quartz veins from a few inches up to 30 inches wide.

Regarding the Harvey lead, Faribault says [2]"The zone of crumplings forming the Mother Seigel roll dips north at an angle of about 70 degrees and intersects the Harvey belt at a lower level, where it forms a similar roll or swell dipping westward. The eastern portion of this roll has already been worked as far west as the Harvey shaft to the depth of 113 feet, where it can be well observed in the western face of the level. About 75 feet farther west, at the bottom of the vertical shaft, on the 170-foot level, the Harvey belt forms into a large roll showing gold and of promising appearance. This roll is undoubtedly the continuation of that worked to the 113-foot level."

At 98 feet east of the shaft on the McLean lead and on the 100-foot level a crosscut driven north cut at a distance of 23 feet two promising leads called the Twin leads. These first dip south, then a few feet farther north they curve abruptly within the crosscut and dip to the north, forming the apex of an anticline. On the south dip they are 3 inches and 6 inches thick, while on the north dip they are 5 and 8 inches, being in rolls on both sides and furnishing about 2 feet of crushing material.

History

This is one of the oldest gold districts of the province, but owing to its inaccessibility it has not received the attention it deserves. A discovery was reported in 1867, and for a time work of a desultory nature was carried on, but it was not until during the last two decades that vigorous mining was undertaken.

In 1868 the field had looked so promising that the erection of two crushers to be driven by waterpower was started, but although they were completed the next year, very little active mining was done. Some very rich drift was found, a large extent of ground prospected, and a number of lodes from 1 inch to 4 feet 6 inches thick were opened on the properties of Messrs. Lyle, Hudson, Cameron, Fish, Chipman, Doran, and Walton. In one place twenty lodes were intersected in a distance of 170 feet. During this year (1869) a few shafts were sunk.

For a few years little except prospecting was done, and although tributers who were working in 1873 expressed their satisfaction with the prospects, little progress could be made on account of the lack of a good crusher.

The Jackson lead received some attention in 1874 and 1875, and was found to carry 16 pennyweights of gold to the ton; stoping was carried on through an extent of 100 feet. The lead was worked again in 1878.

In 1875 the Hall brothers opened the Island lead. Although the difficulty of access to this district made mining almost impossible, these men continued their prospecting for several years and opened a number of veins that have proved rich. In 1879 they opened a curiously contorted lead believed to yield 2 ounces per ton. The same year some promising leads were reported to have been discovered on the Hudson and Greener properties. The Hall brothers were practically the only operators in 1880 and 1881. In 1880, they opened 200 feet of the lode discovered in 1879 and extracted 558 ounces of gold from 191 tons. They also opened five adjoining lodes, the largest of which was the Orient. A 10-stamp mill was in operation. In 1881, in addition to the work done by the Hall brothers, some prospecting was done by Messrs. Grant, Walton, McDonald, and others.

---

[1] Harvey, W. Pellen: "Report on the Egerton Gold Mine".

[2] Report on the property of the Egerton Syndicate, August 8, 1902.

In 1882 the Hall-Anderson Gold Mining Company erected a mill and worked the Serpent and Orient leads. Little work was done on their property the next year until autumn when R. G. McDonald extracted some quartz from the Orient lead. The company resumed work in 1884 and continued until the summer of 1885.

In 1883 some work was done on areas held by Mr. Grant and the Boston and Halifax Company.

In 1882 James Hudson traced several lodes from the Hall-Anderson property to his, and the next year opened a promising belt 3 feet 6 inches wide. In 1884, other discoveries were made, an engine was put in for hoisting and pumping, and it was hoped that the crusher would soon be in operation. Work continued on this property until 1887, when the mill and hoisting machinery were destroyed by fire.

In 1887 the property of the Hall-Anderson Gold Mining Company was reopened by the Egerton Gold Mining Company and work was carried on steadily until the close of 1889. In January, 1890, the New Egerton Gold Mining Company was incorporated to carry on mining on these areas and work was continued under the management of Jas. A. Fraser. A 15-stamp mill was erected and development and mining were vigorously carried on. In 1890 and 1891, this company extracted nearly 450 ounces of gold. In 1890 the Stanley Gold Mining Company was incorporated, a 10-stamp mill run by waterpower was erected, and active mining was carried on in 1890 and 1891. In 1893 an amalgamation was effected between these two companies. During 1895, 1896, and a part of 1897 mining proved very successful and there was an average yield of 225 ounces per month for 2½ years.

At the time of the inspector's visit in 1896 an air compressor had been put in, a new 30-stamp mill was in course of erection, and sinking, crosscutting, and stoping were being vigorously carried on on the Nonpareil and Orient leads under the management of G. F. McNaughton. There was a large amount of ore in sight. In 1897 the Nonpareil belt with its 16 feet of milling ore, and the Mother Seigel belt with 15 feet of milling ore, a short distance to the north, were being mined and milled, and care was taken to strengthen the partition of rock between the two which was only 15 to 20 feet thick. Open-cut work was begun in April, 1898, and continued a few months, when it ceased on account of a cave-in, which occurred when the old workings below were reached. Fifty stamps were operated by this company: 30 run by steam power, and 20 by water.

Work was resumed again in March, 1901, by the Egerton Syndicate, and a new vertical three-compartment shaft was sunk under the management of W. Borlace. This 182-foot shaft was a short distance north of the Harvey and Mother Seigel belts.

During 1910 and 1911 Fraser and McLeod mined a quartz lead lying 500 feet southeast of the New Egerton crusher. In 1910 a recovery of 148 ounces was made from 180 tons of ore and in 1911, 155 ounces from 242 tons. In 1927 diamond drilling operations were conducted by Sir Stopford Brunton and in 1928 the Pioneer Mining Corporation, Limited, had an option on the property.

General Development

The published plan of this district, for which the survey was made in 1897, gives some idea of the extent of the operations, but a considerable amount of work has been done since then on the Mother Seigel and Harvey belts as well as on the McLean and adjacent leads.

For[1] the further development of the district Faribault has offered the Egerton Syndicate some important suggestions. He advised that the level on the McLean lead be continued to the east around the apex of the fold where rolls, probably auriferous, would undoubtedly be encountered.

---

[1] Faribault, E. R.: "Report on the Property of the Egerton Syndicate," Aug. 8, 19 2.

He suggests crosscutting at different levels to explore ground underlying those veins on which rich pay-shoots were found dipping to the east. Levels should be driven along the leads intersected and tests made to determine the location of the shoots. Such shoots will probably dip to the east at an angle of about 30 degrees corresponding to the plunge of the folds. Those cut on the 100-foot level would crop at the surface some 170 feet to the west and would have a length overhead of about 200 feet. These could be most economically worked from the 100-foot level by overhand stoping.

The zone of crumpling dipping north 70 degrees and producing rolls on Mother Seigel and Harvey belts probably extends into other belts lying to the north of the Harvey belt and forms other large rolls of pay-ore. To tap these, crosscuts should be driven north from the 170-foot level on the Harvey lead, and it is estimated that 100 feet east of the vertical shaft the crumple will be cut 20 feet north of the Harvey, and that 200 feet east of the shaft it will be cut 40 feet north.

The possibility of developing the ground by means of a deep, vertical shaft is considered, and it is estimated that, since the anticlinal axial planes dip north, a vertical shaft, sunk about the lot line between areas 994 and 995, would cut the apex of the north fold at a depth of 150 feet and that of the southerly one at a depth of 575 feet. It is also estimated that such a shaft would cut the Walton-Doran lead at about 600 feet and the rich streak on the New Egerton at 200 feet. From this vertical shaft crosscuts should be driven every 100 feet and levels driven on the veins intersected.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1883	46	17	14	83		11	6
1884	88	14	3	107		16	13
1885	424	15	6	896		9	4
1886	.....	.....	.....	.....	.....	.....	.....
1887	398	5	0	829		9	15
1888	946	8	0	2,151		8	19
1889	786	9	0	1,416		11	2
1890	2,305	2	18	3,017		15	6
1891	2,396	10	12	4,562		12	16
1892	1,236	17	0	2,412		12	13
1893 (9 mos. ending Sept. 30)	350	17	0	788		8	22
1894 (Year ending Sept. 30)	552	0	0	1,173		9	9
1895	2,661	12	0	4,734		11	5
1896	3,151	5	0	5,568		11	5
1897	2,856	18	0	9,158		6	5
1898	537	0	0	3,495		4	19
1910	148	18	0	180		16	13
1911	155	7	0	242		12	20
	19,043	16	5	40,813			

FOREST HILL[1]

Location

Forest Hill gold district is situated in the central part of Guysborough county about 6 or 7 miles northeast of Country Harbour gold district. It is 2 miles south of the Salmon River road leading from Country Harbour crossroads to Guysborough.

Geology

The Gold-bearing series here forms a narrow neck with great granite masses to the north and south from which numerous dykes are intruded into the sediments, which are altered to andalusite, staurolite, and garnetiferous schists. This district, therefore, affords excellent opportunities for the study of the relation of the granite to the Gold-bearing series, and the metamorphic phases of the latter.

---

[1] Plan published.

The Goldenville formation here forms an anticline the axis of which has a northwest course gradually curving to the west and southwest and probably finding its continuation in the much disturbed fold of Country Harbour district. On the McConnell property this anticline plunges to the east at an angle of 3 degrees. It is an overturned fold and the strata on the south side dip to the north at angles varying from 70 degrees to 90 degrees. At a distance of 100 feet north of the anticline a syncline has been located, but the covering of drift prevents a study of the structure farther north.

Character of the Deposit

The productive veins lie on the south limb of the anticline, dipping to the north at high angles. The veins that have proved the most remunerative are the Salmon River, Mill-shaft, Ophir, and Schoolhouse. The thickness of these is indicated on the plan of the district, but these figures do not in all cases represent the total thickness of the ore-bodies, as frequently portions of the slate belt adjacent to the vein are found sufficiently auriferous to crush. The Schoolhouse vein is the one that is indicated on the plan as the New lead, but most of the work that has been done on this vein has been done since the plan was published and consists in the exploiting of the eastern extension of the vein. Underground workings show that this vein is cut by a fault carrying a small quartz vein and dipping at a low angle to the southeast. The slate belt containing the Schoolhouse vein is about 3 feet thick and dips north 72 degrees, but it flattens and thickens on approaching the fault, becoming at the compressor shaft 7 feet thick. Below the fault the belt dips almost vertically and is shifted only slightly to the north. Some of the pay-shoots in this district dip at low angles to the west as in the case of the Ophir lead and the west end of the Salmon River lead. On the other hand, in the eastern end of Salmon River lead and of the Schoolhouse lead the pay-shoots dip in the same direction as the plunge of the anticline. In the latter vein zones of barren quartz have been recognized alternating with rich shoots dipping east. In addition to these more important veins, some more or less auriferous veins have been prospected on three different properties one mile farther west, on the south side of Mill lake, where numerous granite dykes follow the stratification planes of the sediments and cut the strata and the interbedded veins in all directions, creating disturbances that render prospecting very difficult.

History

The history of this district does not extend far into the past. S. D. Hudson discovered the first good-looking quartz boulders in June, 1893, and in June, 1894, he and his brother discovered the Ophir lead, and a little later the Mill-shaft lead. Among those who undertook to develop the district were S. D. Hudson and J. C. McDonald. The latter opened two veins, known as the Salmon River and Ophir leads, on areas that were afterwards worked by the Modstock Gold Mining Company. Operations were carried on in 1895, and at the beginning of 1896 a large force of men was engaged getting out quartz for the 10-stamp mill that McDonald had erected. What was only a wilderness in 1894 had by the end of 1896 become an active mining district with three mills, two or three stores, a schoolhouse, and a population of 200 or 300.

Mining operations were very active during the first five or six years of the district's history, then came a period of idleness, followed in recent years by a revival of interest and the camp is again the scene of activity. A number of leads have been developed, such as Salmon River, Ophir, New or Schoolhouse, Barrel, Mill-shaft, McConnell, Fraser, Hudson, and Camp.

During the nineties work was carried on chiefly by the Modstock Gold Mining Company and the McConnell Gold Mining Company, the property of the latter company lying immediately to the east of that of the former. For the first year or two the Salmon River and Ophir leads received the most attention, and operations were then extended to the New or Schoolhouse lead and to a limited degree to a few other veins in the vicinity. The Modstock Company was particularly aggressive and in 1898 had as many as sixty-eight men at work. The management of this mine was for a few years in the hands of W. J. McIntosh and passed later to G. F. McNaughton. It closed in January, 1901, but was reopened in March, 1902, under the management of B. E. Patterson, and closed some time later. The McConnell mine was for a considerable time managed by J. McConnell. Among other companies that were working during the nineties may be mentioned E. S. Sweet and Company, and the Phoenix Mining Company.

In 1901 the Strathcona Mining Company was the only one engaged in mining operations in this district, and during this and the succeeding year this company worked the Schoolhouse lead. Then followed a period of idleness. In 1905 the Modstock Mining Company and the Strathcona Mining Company under the management of J. C. McDonald were engaged in active work on the Schoolhouse lead.

In April, 1907, work was begun by McDonald and Copeland under the management of J. C. McDonald, on the property formerly worked by the Modstock Gold Mining Company. Operations were in progress until the spring of 1909, and during 1908 an average of fifty men were employed. The mine had by no means been exhausted, for from 155 tons of quartz crushed in 1907, 375 ounces of gold was extracted, and from 524 tons crushed in 1908, 1,119 ounces of gold was obtained, and 415 ounces of gold was recovered from 289 tons in 1909.

The Bendigo Gold Mining Company, Limited, worked the Hard lead, a vein 2 to 2½ inches wide, in 1915 and 1916. Some work was also done on Salmon River lead. In 1915, 1,229 ounces of gold was obtained from 653 tons of ore, and in 1916, 675 ounces from 429 tons. In 1926 a shaft was sunk by McGrath and Sutherland on a lead in the southwestern part of the district. There are three shafts on this property, an old shaft 40 feet deep, the McGrath shaft, and the O'Brien shaft 25 feet deep. The O'Brien and McGrath shafts are in biotite-muscovite garnet schist; in the former, quartz veins 2 to 16 inches wide are intercalated in schist throughout a width of 6½ feet and in the latter there is an 18-inch quartz vein on the south wall that increases in the bottom of the shaft to 4 feet in thickness.

General Development

No very definite idea of the extent to which operations were carried on can be obtained from the published plan, on which the depths of the different shafts are marked, for it was not until 1895 that any important mining was done, and since the publication of the plan in 1898 important operations have been in progress, more particularly on the Schoolhouse lead. A little information is available in the annual reports of the Department of Mines for Nova Scotia for the years 1905 and 1908.

The production of this district is included with others under the heading Stormont, found in the description of Isaac Harbour.

GOLD LAKE

Gold Lake, or Scraggy Lake, is situated in Halifax county 4 miles south of Moose River Gold mines on the south shore of Gold lake. It lies on the Killag-Goldenville anticline and a few interbedded veins more or less auriferous have been tested. According to the report of the Chief Commissioner of Mines for Nova Scotia, 1867, a discovery had been made here at some earlier time. Numerous quartz blocks are scattered all along the anticline in this locality. A small crusher was once erected here to test the ore, and pits were sunk on several veins.

GOLD RIVER[1]

Location

Gold River district,[2] sometimes called Chester Basin, is situated on Gold river in the county of Lunenburg, one mile above the bridge spanning the stream on the shore road, where it discharges into Chester basin. It is 5 miles north of the town of Chester and 1 mile west of Chester Basin, a station on the Canadian National railway.

---

[1] Plan published.

[2] Faribault, E. R.: Geol. Surv., Canada, vol. XIV, pt. A, p. 219.

Geology

Owing to the surface being covered with a thick deposit of glacial drift, leaving very few rock exposures, and also owing to the fact that at the time the survey of this district was made there was little mining activity and the workings were consequently inaccessible, great difficulty was experienced in working out the geological structure. Much of our knowledge of the geology is, therefore, dependent on the good sections available along the deep valley of Gold river and on information acquired from men who have worked from time to time in the different mines.

The district lies on an anticline running southwest through Vaughan lake, Maitland forks, and Leipsigate. The anticline is well exposed on Gold river at Hemlock fall, where it pitches southwest 15 degrees, and its position in other parts of the district was determined by means of the interstratified quartz veins. At the western limit of the district a 6-inch vein opened in a slate belt by N. W. Keddy on area 1076, block 1, curves around the apex of the fold and pitches west 37 degrees; and at the eastern extremity on area 314, block 3, a 5-inch lead discovered by Charles Mills in a wide slate belt just north of the Gammon group of leads curves around the apex of the anticline and pitches east 30 degrees.

"On the south side of the anticline the strata curve abruptly and dip southerly at high angles, increasing rapidly and reaching 85 degrees at a distance of 2,000 feet to the south of the anticline. On the north limb the strata dip at much lower angles and vary from 35 degrees near the axis to 45 degrees at a distance of 1,700 feet northward from it. The axis-plane of the fold dips thus to the north at an angle of 65 degrees, and the upheaval has the form of a much elongated, elliptical dome whose centre is not far east of the bridge spanning the East branch."

An important crumple has been observed in a shaft sunk by T. N. Baker, 500 feet south of the Gammon leads, on the intersection of the Baker and Vermilion veins. The foot-wall of the Vermilion is here folded in a small anticline which runs north 76 degrees east and plunges east 31 degrees; and 40 feet to the north is a small syncline, beyond which the rocks assume their general strike towards the northeast.

"The structure of the anticlinal fold has been subjected to much disturbance since the folding and the deposition of the interbedded quartz veins. Unfortunately, the rock exposures are too few and the developments accomplished are yet too limited to determine with any certainty the many faults affecting the district. Several of them run transversely through the anticlinal fold. A left-hand fault has been observed to give a displacement of 75 feet on the North Star lead, and running a little east of south along the west side of a swamp, it crosses the river at Big Cumberland pool and passes west of the Hemlock fall, where the anticline appears to have been shoved 200 or 300 feet, to the north of the Croucher lead. An important left-hand fault appears to have displaced the rocks along the eastern branch, but its direction could not be ascertained. A left-hand fault, giving a shove of some 20 feet on the Croft Hill leads, runs up the river, passes east of the Jumbo crusher, and 80 feet east of the 80-foot shaft on the Jumbo lead. A few small faults have also been encountered in the workings of the Captain lead at the east end of the district. There is also probably a left-hand fault of 100 feet or more west of Baker's workings on the North Star lead, and possibly also to the east of them."

Character of the Deposit

Nearly all the veins worked in this district are of the interstratified class and most of these are found on the south limb of the anticline. They are very persistent along the strike and probably along the dip also. The most striking group of leads so far as size is concerned is the Gammon group, a short distance south of the anticlinal axis, in the eastern end of the district. Seven large quartz veins, aggregating 70 feet in thickness, occur within a distance of 170 feet, and some of these may be rich enough to form a large, low-grade deposit. Among the most important leads may be mentioned the Captain, Picayune, North Star, Mill, Vermilion, Fox, Jumbo, Baker (a cross vein), Brisco, Hiseler, Croft Hill, and Iron. All of these with the exception of the North Star lie on the south limb of the anticline, the North Star lying about 1,500 feet north of the axis.

"On the northwest side of the anticlinal fold the strata curve gently in a southwesterly direction towards the main anticline and form a broad bulge favourable to the formation of quartz veins. The rock section exposed along Gold river, from Innes and Big Cumberland pool to the head of Mosher fall, presents some eighteen interbedded veins situated on this bulge. Some have been tested and found auriferous, but none has been prospected to any extent." Since the survey of the district a few veins have been discovered between the Croft Hill and Brisco leads on the west side of the river, some of which have been worked by the Chester Basin Gold Syndicate.

Some very rich drift has been found in this district the source of which has not yet been discovered. The richest was probably that found on the old Touquoy property in the southwestern part of the district, and much work was done by Damas Touquoy and others to find the vein, but the float gold quartz was found at the top of drift 20 or 25 feet deep and may have travelled a long distance. In the eastern part of the district some highly auriferous drift was found along a swampy depression, and the vein from which it came, designated the Swamp Angel, had not been located up to 1908, when it was reported to have been found and to be a cross vein rich at its intersection with some interbedded veins in the vicinity of the Captain lead.

Work in this district is so scattered, and on account of the depth of the drift prospecting has been so difficult that it is impossible to determine the zones of special enrichment. In the eastern end of the district and on the southern limb of the fold the rolls and pay-shoots generally dip east at a low angle, but in the North Star vein the rolls and pay-shoots dip west and a rich roll has been worked 600 feet in length and 100 feet in depth. A streak of rich ore was found on the Vermilion lead on the small crumple affecting it, and it is probable that other veins to the north and south will also be enriched at the point where they are affected by the same crumple.

History

Although this is one of the earliest discovered districts of the province it never rose to the rank of one of the leading producers and has been the scene of a great deal of mismanagement and blundering.

Heatherington says the opening up of the district is due to Mr. Dimmock of Chester, who found the first gold in quartz in September, 1861. A prospecting licence and some leases were applied for in 1863 and one company had sufficient confidence in the prospects to erect a crusher. The district seems to have attracted little attention and no record is given of mining until 1867 when a few lodes from 3 inches to 6 inches wide were opened by Colonel Briscoe, a shaft was sunk 37 feet, and some trenching done. A crusher was in course of erection this year. The Colonel's operations were suspended in 1868 and only a little other prospecting was done. Then the district seems to have been quite idle until 1879 when a little prospecting was done again.

Then came another long period of idleness. About 1885, Mr. Mills discovered some leads on what is now known as the Jumbo mine and sold to an American company. In 1886 some work was done on this property, and a 20-stamp mill was erected near the confluence of the eastern branch and Gold river. In 1887 some low-grade ore was crushed, but the drought compelled the closing of the works, as crushing, hoisting, and pumping were dependent on waterpower.

Prospecting was carried on by Chas. Mills, A. Hiseler, and others, and search was made for the Vermilion and Swamp Angel leads, the sources of rich drift. It is said that the Vermilion lead, so called from the colour of the quartz blocks broken from it, was found in 1889, but the Swamp Angel had proved too elusive for the prospectors of Gold river up to 1908 when it was claimed to have been discovered.

About 1887 the Neptune Gold Mining Association was formed and in 1889 had a large quantity of ore blocked out. This year 501 tons of ore was crushed, which yielded 166 ounces of gold, and the crushings dwindled in amount the following years until in 1892 only 93 tons were crushed, yielding 5 ounces. The yield for 1893 and 1894 was much better, and at the end of the latter year the Neptune Company's areas and plant were sold to the Lincoln Gold Mining Company.

In 1893 some areas belonging to G. J. Hiseler were sold to the Gold River Mining Company, and this company during that year recovered 205 ounces of gold from 269 tons of ore.[1]

---

[1] Industrial Advocate, Nov., 1899, p. 14.

In 1895, there were four mills with a total of 47 stamps in the district and this year was marked with considerable activity. The Lincoln Company started operations. the Oakdale Company, with B. C. Butterfield as manager, opened three veins, among which was the Captain, hoisted a good pile of quartz, and completed a 10-stamp mill. Miner T. Foster and Amos Hiseler carried on prospecting near the river and uncovered some rick-looking ore; while T. N. Baker opened a vein with a rich pay-shoot in the northeastern part of the district and milled the ore at a 2-stamp mill that he had erected.

In 1896 the Lincoln mine was operated under the management of D. C. Butterfield, nineteen men were employed, and ore from the Captain and Picayune leads was crushed at the 10-stamp mill. Amos Hiseler had seven men employed on a cross vein. the Verge brothers worked the Oak Tree lead and also opened up the Shattuck lead. and five men were employed at the Baker mine on the North Star lead. The Victor mine, however, was idle.

The next year the Victor mine mill, the Jumbo mine mill, and the Lincoln mine mill were all idle, but G. J. Hiseler had five men working on his property north of the Lincoln mine, and Baker continued operations on the North Star lead. Baker milled some rich quartz in 1898 and was still at work in 1899.

In 1900, returns were made by T. N. Baker, G. J. Hiseler, and Jas. Reeves and in 1901 by T. N. Baker, who from 1895 to 1901, inclusive, reported about 1,587 ounces of gold from 767 tons of ore. Very little mining was done here in 1902, but P. H. Moore had a few men at work in August fitting up the plant at the Lincoln mine. preparatory to pumping out the Captain lead, and A. Hiseler did a little work on the Baker property. In 1903 P. H. Moore did considerable work, and also reported a little crushing in 1905. In 1906 the Vermilion lead received a little attention, but not much gold was reported. Work was continued in 1907 on the Vermilion lead on the Reardon Reeves property, but the principal operations this year were conducted by the Chester Basin Gold Syndicate, A. B. Stewart, manager. This company started work in September, 1906, on area 835 in the southern part of the district, and two shafts were sunk on a small, unnamed lead and another lead to the north of it was opened up. Crushing was done at a 5-stamp mill and a very satisfactory yield was reported in 1907. A dam was constructed across Gold river to furnish power for pumping and hoisting.

In 1908 the Chester Basin Gold Syndicate had twenty men at work, and although 422 ounces of gold was returned the principal work was in the way of development. In June, this company secured an option on the Vermilion mine and took out about 40 tons of ore, and the Jumbo mine was also unwatered and some small tests were taken out. A small amount of work was done this year on the Hiseler property to the south of the main workings of the Chester Basin Gold Syndicate, and prospecting was carried on in different parts of the district by George Hiseler, P. H. Moore, and others.

The Chester Basin Gold Syndicate had fifteen men employed in 1909 and 307 ounces of gold was recovered from 791 tons of ore. In December, 1908, the Uniacke Mines and Power Company, Limited, commenced operations on the areas formerly known as the Uniacke or Bank property. Their principal work was done at the east shaft on the Vermilion lead, but this was later discontinued and a fissure or large angular supposed to be the Swamp Angel, 380 feet east of the main works, was mined. The mill known as the S. R. Hill mill was repaired, and a Wifley table was added to the equipment. From 100 tons of ore 87 ounces of gold was recovered.

Work was continued in 1910 by these two companies. The Chester Basin Gold Syndicate recovered 162 ounces of gold from 191 tons of ore. The Uniacke Mines and Power Company, Limited, worked the Lacey and Vermilion leads and recovered 58 ounces of gold from 51 tons of ore. In 1911 this company took over and worked the property of the Chester Basin Gold Syndicate and continued operations on a small scale in 1912. In 1915 J. A. Wheeler recovered 67 ounces of gold from 40 tons of ore taken from the North Star mine.

General Development

There is little definite information available on this point besides what can be obtained from a study of the published plan. The leads which have been worked on the south side of the anticline have had shafts sunk on them as follows:

Jumbo,[1] 80 feet; Vermilion, 40 feet; Captain, several shafts at the Victor mine, 200 feet; and at the Lincoln mine 119 feet and 250 feet; Picayune, 200 and 211 feet; Mill, 100 feet; Fox, 60 feet; Briscoe, 40 feet; Hiseler, 50 feet; Croft Hill, 40 feet; Iron, 40 feet.

In 1906, two shafts were worked on the Vermilion lead each 40 feet deep, and the work was confined principally to the east one where levels were driven and some stoping done. In 1907 the west shaft was sunk an additional 35 feet, a level driven work was confined principally to the east one where levels were driven and some east from the bottom 30 feet, and the ore stoped out between this and the old workings above; in 1908 the west shaft was sunk 30 feet and the east shaft 12 feet. In 1909 the latter was continued to a depth of 92 feet and the 80-foot level was extended east to a length of 115 feet.

The Chester Basin Gold Syndicate had by the end of 1907 sunk two shafts on their 3-inch lead the east one 65 feet and the west one 112 feet. From the bottom of the east shaft levels were driven east 75 feet and west 89 feet, connecting with the west shaft. The stopes in the east level for a distance of 30 feet east of the shaft were carried to the surface. In 1908 a 40-foot winze was sunk from the 100-foot level at a point 80 feet east of the west shaft, and the following year a level was driven east 145 feet, and ground was stoped for a height of 30 feet along its entire length. At a point 33 feet east of the west shaft an incline for hoisting was sunk to the bottom of the winze.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1895 (Year ending Sept. 30)	120	15	0	80	1	10	4
1896	432	11	3	425	1	0	8
1897	542	19	5	287	1	17	20
1898	667	13	23	201	3	6	5
1908	474	16	11	712	0	13	8
1909	401	4	0	891	0	9	0
1910	227	18	19	250		18	6
1911	45	4	5	49		18	11
1912	27	3	0	36		15	2
1915	66	9	0	40	1	13	5
	3,006	14	18	2,971			

HARRIGAN COVE[2]

Location

Harrigan Cove gold district is situated in the southeastern corner of Halifax county, near the Atlantic coast, and just north of the post road. It lies 5 miles east of Port Dufferin, which is reached by packet from Halifax or by stage coach from Shubenacadie, 70 miles distant.

Geology

The Goldenville formation is here brought up in a broad zone by the Tangier-Harrigan Cove anticline.[3] "A good section of the rocks is well exposed across the district along the area line dividing lot 215 and 216 on the St. Anthony property. It shows that the series have been plicated into one main anticlinal fold, on the south limb of which a subordinate crumple occurs at a distance of 1,400 feet to the south of the axis.

The main anticline was located on area 616, block 2, along a small, swampy brook running eastward, at a distance of 2,000 feet north of the St. Anthony lead.

---

[1] Geol. Surv. Canada, vol. XIV, pt. A, p. 221.
[2] Plan published.
[3] Faribault, E. R.: Geol. Surv., Canada, Ann. Rept., vol. XV, pt. A, p. 418.

The fold is broad; the angle of dip increasing gradually on both limbs until it reaches 90 degrees half a mile north of the axis and 40 degrees at a distance of 800 feet to the south of it. . . . .

At a distance of 1,250 feet south of the main anticline the strata curve in a synclinal, and 150 feet farther, into an anticlinal, fold. The two folds converge towards the east and west on area 390, beyond which the crumple terminates.

The south anticline runs north 75½ degrees west and shows prominently 600 feet north of the St. Anthony lead along a bold ridge for 1,600 feet, beyond which it is concealed by a hill of boulder clay running transversely north and south. On the north limb the strata dip 35 degrees, while on the south the angle of dip increases gradually and reaches 60 degrees at a distance of 1,500 feet south of the axis.

Two left-hand faults were determined crossing the anticline; one, the St. Anthony fault, occurs on the eastern part of area 319, runs south 25 degrees west across the auriferous belts, giving a displacement of 90 feet on the anticline; the other passes on area 278, where the throw is 50 feet south, runs southerly, and probably meets the former fault between the St. Anthony and the A. Kent Archibald works. Several important faults undoubtedly occur to the westward, but they have not been made out yet." Some of these probably lie between the main producing portion of the district and Eel brook and have caused considerable displacement towards the left.

Character of the Deposit

All the veins of this district follow the stratification planes and all those that were productive lie on the south limb of the southern anticline in an area extending southward from the anticlinal axis 1,800 feet and 2,800 east and west. "Several large, superimposed saddle-veins have been uncovered along the apex of the fold pitching westward at a very low angle. On the north dip they pinch out immediately north of the axis, but on the south limb they extend to a great depth, as is well proved at the surface by the cropping out of a succession of veins extending for a great distance to the south of the axis, the upper portions of which were denuded away to the present surface level." A vertical shaft sunk on the apex of the fold shows that beneath these superimposed saddle-veins lies a succession of others which have not been exposed on the surface. In the eastern end of the district a few veins have been uncovered on both limbs of the north or main anticline at some distance from the axis, but although some of them are corrugated and some auriferous drift is reported to have been found in the vicinity, none has proved sufficiently auriferous to warrant development. In the western end of the district a few corrugated veins have been found close to the apex of the north anticline, which at this point plunges to the east, and a 45-foot shaft was sunk on one of these veins. Two veins have also been tested on the west side of Eel brook.

Of the auriferous veins the St. Anthony, also known as the Bishop, lead, has proved by far the most productive. This lies about 700 feet south of the axis of the south anticline in a 3-foot belt of slate, half of which was milled along with the 8-inch vein, and a rich pay-shoot dipping west was worked 200 feet in depth and 500 feet in length to the St. Anthony fault, beyond which it was not recovered. This vein has been traced 1,600 feet in length east of the fault; the foot-wall is a bed of whin 30 feet thick, the heavy whin foot-wall being a feature in common with many of the best veins of the province. On the Archibald property, which lies to the west of the St. Anthony mine, over 25 belts of veins have been uncovered 300 feet south of the anticline, across 550 feet of strata. Several of these are auriferous and have been mined, the most important of which are the McDonald, Bishop, Slate, and Galena leads. In these the rolls and pay-shoots dip west at a low angle, and lie in a zone running northwest and southeast. In the McDonald lead were found some very fine crystals of gold consisting of a combination of the cube and rhombic dodecahedron. Some distance southeast of the Archibald property lies the McMann property on which two large belts of veins were mined to a limited depth. Between the St. Anthony lead and the anticline rich drift has been found and prospecting by means of trenches has revealed several large belts, but none apparently rich enough to warrant operations.

History

Gold was discovered in this district in 1868, but it was not until the last of the century that mining operations became very active.

In 1872 the Galena and other leads showing free gold were exposed and a mill was erected by a Mr. Smith, but operations ceased early the following year. In 1874, several other leads were found south of the Galena lead, and during the next year a crushing of 15 tons yielded 9 ounces. In 1880 some work was done by Mr. Mott on the South and Slate leads, but although they yielded well operations were for some reason discontinued. In 1899, Thos. Cooper exposed several leads by trenching and did a little sinking. In 1900 and 1901, Kent Archibald sank shafts on the Iron lead and the Bishop lead which is thought to be a continuation of the lead worked by the St. Anthony Gold Mining Company to be described later. In 1901, a 5-stamp mill was erected. In 1902, Munroe Archibald, who has the work in charge, confined his operations chiefly to the McDonald lead in which some exceedingly rich gold was found. In 1903 and 1904 some sinking, crosscutting, drifting, and stoping were done. After this the property was held by the Harrigan Cove Gold Mining Company, and under the management of Munroe Archibald the work of crosscutting and driving levels was continued until some time in 1907, when the mine was closed. Late in the eighties the McMann Bros. erected a 10-stamp mill and did some prospecting in the southern part of the district, and in the early nineties quite a little exploratory work was carried on by Edward Whidden who bonded the mill erected by McMann Bros. Again, in 1900, Mr. McMann crushed some ore from the North lead.

The most productive lead of the district was the Bishop or St. Anthony lead, worked by the St. Anthony Gold Mining Company. Some work was done on this vein in 1899 by J. G. Bishop. This mine was acquired by the St. Anthony Gold Mining Company in February, 1900, and for two or three years operations were actively carried on. During 1900, the output of 200 to 260 tons per month was crushed at McMann's mill, but a 10-stamp mill and a Wilfley concentrator were erected later by the St. Anthony Company. From March to August, 1901, 1,281 tons were crushed, yielding 1,289 ounces. In 1903, this company tested some leads north of the St. Anthony, chief of which is probably the Mica lead.

During 1903 and 1904 Messrs. Boak and Oland sank a vertical shaft on the apex of the anticline, cutting several saddle veins averaging 9 to 60 inches of quartz without slate within a distance of 109 feet, and at the 100-foot level short crosscuts were driven to the north and south, intersecting the legs of the same veins. A production of a few ounces was made by the St. Anthony Gold Mining Company in 1915 and 1916, and in 1915 a small amount of work was done by the Bradford Mines, Limited.

General Development

The extent of operations is well indicated by the published plan for which the survey was made in 1902.

Work has been done on the Archibald property since then and the crosscut started south from the McDonald lead in 1905 had been extended 100 feet in 1906 and its continuation from the McDonald lead northward had been extended 200 feet. In these crosscuts fifty leads 2 inches to 4 feet wide and nearly all lying in slate beds were cut. A total of 470 feet of drifting had been done on these, but the principal work was limited to the Slate and Galena leads, the face on the former being 255 feet east and on the latter 180 feet east.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1899	223	5	3	387		11	13
1900	1,705	19	12	1,813		18	19
1901	2,628	9	0	3,071		17	3
1902	1,564	3	3	3,445		8	26
1903	1,091	10	15	1,613		13	12
1904	269	3	0	803		6	17
1905	15	0	0	65		4	15
1906	142	5	0	546		5	5
1907	259	5	0	1,267		4	2
1912 (mortared)	2	10	0				
1915	8	11	0	17		10	1
1916	10	12	14	25		8	12
	7,920	13	23	13,052			

INDIAN PATH

The Indian Path mine lies in Lunenburg county on the peninsula lying between Lunenburg bay and Lahave river. It is 5 miles from the town of Lunenburg by a good wagon road.

The veins are found on an anticline in black ferruginous slate of the Halifax formation. The strata of the north limb dip to the north at an angle of 80 degrees; on the south limb they dip at a very low angle.

The veins are interstratified, contain visible gold, and [1]carry blende, galena, mispickel, and cubical pyrite. Only one vein was worked; it shows rolls and was richest immediately north of the apex of the anticline where it assumed a banded structure and was well mineralised. It was worked to shallow depths, the deepest pit being 35 feet. From the east opening to the west is 1,670 feet and it has been worked about half that length. On the apex of the fold the quartz of the veins is coarsely granular and does not look good.

It is reported[2] that gold was discovered here in 1862 and in the Report of the Chief Commissioner of Mines for 1868 we learn that several veins were discovered by Messrs. Waddilow, that a shaft was sunk 25 feet on one of them, levels were driven, and a crusher to be run by waterpower was erected. Some[3] prospecting was done in 1869 and ten or twelve leads varying in width up to 5 feet were exposed; a test of 25 tons of the surface material showed that it could be crushed at a profit of a shilling a ton. Another discovery made this year was that a great deal of gold had been lost the preceding year in the mercury that passed into the tailings. The Messrs. Waddilow continued work of an exploratory character in 1870, and since then there has been a little prospecting and crushing, but the work has been very desultory. In 1876,[4] a little quartz was crushed; in 1884 Lithgow and Archibald erected a 10-stamp mill run by steam power, pumped out the mine and put it in repair, but no crushing was reported; in 1896, A. J. Cowie of Halifax rebuilt the Lithgow and Archibald mill and crushed a few tons, but the results were not encouraging. A little prospecting has been done in more recent years for C. U. Mader.

There may be other veins underlying the one worked, and crosscutting would probably open their ore-shoots.

---

[1] Hind, H. Y.: "Report on Mount Uniacke, Oldham, and Renfrew Gold districts", p. 58

[2] Industrial Advocate, vol. V, 5, p. 8.

[3] Report of Chief Commissioner of Mines, 1869, p. 12.

[4] Industrial Advocate, vol. V, 5, p. 8.

Production

Year	Tons crushed	Ore extracted		
		Oz.	Dwt.	Gr.
1869	187	38	0	10
1870	102	5	18	12
1876	15	3	14	8
1896	26¾	4	19	16

ISAAC HARBOUR[1]

Location

Isaac Harbour gold district is situated on Isaac harbour in the county of Guysborough on the Atlantic coast and 50 miles by coach road south of Antigonish, a station on the Canadian National railway. It can also be reached twice a week by packet from Halifax. The Lower Seal Harbour division, of which a description is given here, lies 2 miles east of Isaac harbour.

Geology

The Goldenville formation is here exposed and has been folded into three anticlines running parallel east and west across Isaac harbour. These are named the north, middle, and south anticlines. "The[2] original structure of the folds has been much disturbed transversely by a great dislocation coming from the northwest and following the Northwest Branch brook to the head of the harbour, as shown on the published plan of Upper Seal Harbour. From the head of the harbour it runs south 15 degrees east (magnetic) and passes between Hurricane point and the eastern shore and through Webb cove and Dung cove, giving a horizontal, left-hand throw of some 1,200 feet to the north on each of the three anticlines. Several minor faults have also been determined, branching off in a northeasterly direction from the main harbour fault."

A good section for the study of the structure of the rocks is exposed along the west shore of the harbour from Holly point to Ragged point.

"*Isaac Harbour North Anticline.*[3] This anticline is well defined at the North Star mine where mining developments show the Grant, Saddle, Little Saddle, McPherson, and Burke leads to curve inside and underneath one another on the archcore of the anticlinal fold and pitch to the west at an angle of 18 degrees from the horison. On the north leg the strata dip north at angles increasing gradually from 45 degrees on the Grant and Burke leads to 75 degrees at Holly point; while on the south leg the dip increases abruptly to 75 degrees, flattens again and curves in the synclinal fold of the North Star lead, 120 feet south of the anticline.

In depth, the axis-plane of the fold dips about vertically.

The course of the anticline is north 56 degrees west (magnetic) and that of the syncline is north 59 degrees west, the folds converging eastward under the harbour; and at Hurricane point, they are only 12 feet apart and form a crumple very favourable to the development of rich auriferous veins conformable with the strata, one of which, the Hurricane Point lead, crops out at the surface and has already been much worked and yielded handsomely. Immediately east of Hurricane point, the crumple is cut off by the main harbour fault and thrown north some 1,200 feet"; it shows on the eastern shore as a flexure, on which are developed rich rolls on the Mulgrave leads.

A fault in the eastern part of the district crosses this anticline and gives the Mulgrave lead a horisontal displacement of 130 feet to the north on the east side and the Mundic lead about 250 feet. This fault runs from area 18, block 2, down Dung Cove brook south 37 degrees west to the salt water pond where it intersects the main harbour fault.

---

[1] Plan published.

[2] Faribault, E. R.: Geol. Surv., Canada, vol. XV, pt. A, p. 407.

[3] Faribault, E. R.: Geol. Surv., Canada, vol. XV, pt. A, p. 408 .

Middle Anticline. Because of the depth of the drift and the lack of mining operations the middle anticline could not be definitely traced. It is concealed on the western side of the harbour, but lies about 500 feet south of the lighthouse and extends west to Country harbour covered by drift carrying auriferous quartz blocks. On the eastern side of the harbour it runs through Sculpin cove just north of Salmon rock but at the main harbour fault a little farther east it is thrown north 1,200 feet; beyond this it runs west, as far as the Dung Cove Brook fault where it is thrown north 250 feet and resumes its course towards the head of Crane pond on Betty brook. The fold is broad and both limbs dip at angles increasing gradually to 65 degrees on the north and 55 degrees on the south.

South Anticline. This is well exposed at Ragged or Bear Trap point and for a mile farther west along the shore of Country harbour where a few cross-veins were observed. It lies near the south of Red head and at the main harbour fault is thrown 1,000 feet north; it crosses the road at a point where David Buckley developed a flat lead curving over the apex of the fold, but east of this it is heavily drift covered.

Character of the Deposits

The veins are of the interstratified type and the ore is concentrated in shoots, which bear the same intimate relations to the geological structure as is noticed in other districts.

Those deposits found on the northern anticline have received more attention than others. It has been pointed out that the north anticline and syncline converge at Hurricane point and form a crumple along which work has been profitable. Mining developments show that the paying portions of the veins are of great length, are well defined, and are confined to the crumple. The North Star lead has been mined on the western pitch of the north limb of the synclinal fold to a depth of 492 feet, the others were worked on the western pitch of the anticlinal fold: the Saddle lead 100 feet, the McPherson lead 120 feet, the Burke 258 feet. The Hurricane Point, the North Mulgrave, and the Mulgrave leads have been mined respectively 430, 400, and 2,200 feet in length, and 100, 190, and 200 feet in depth.

The pay-shoot of the Mulgrave lead dips west 12 degrees and it is no doubt the eastern extension of one of the rolls of the Hurricane Point flexure. The axis-plane of the flexure runs south 58 degrees east and dips vertically, while the veins strike south 63 degrees east and dip north 62 degrees. Large rolls of auriferous quartz lie along the intersection of the veins with the axial plane of the flexure.

"At the Victoria mine, on the eastern shore of the harbour and 1,500 feet to the north of the Mulgrave, a roll of auriferous quartz, reported to be 10 feet thick and pitching east 35 degrees, has been worked for some 200 feet in length and 105 feet deep. At the Goldfinch mine, 2,100 feet to the southeast of the Victoria mine and 1,380 feet to the north of the Mulgrave lead, a roll of paying quartz, 12 inches thick and pitching east 15 degrees, was mined 300 feet in length and 90 feet deep. It is remarkable that these two rolls, as well as the auriferous drift found on the shore to the northwest of the Victoria, and 1,500 feet to the southeast of the Goldfinch mine, are all situated along the same line, running south 59½ degrees east and parallel with the Mulgrave line of pay-rolls, but with the differences that on the latter the rolls pitch westward. As the strata strike south 65 degrees east the Victoria-Goldfinch line of rolls intersects them at a slight angle, and probably forms a succession of auriferous rolls occurring on certain belts towards the southeast which might prove productive if developed." The deposit at Lower Seal harbour lies in the same line and is possibly produced by the same flexure.

The only important leads on the middle anticline are situated 700 feet north of the axis, and here the Mundic was worked for a length of 700 feet and a depth of 120 feet. A large block of rich quartz was discovered immediately south of the Mundic lead, but its source has not been found.

About 1,100 feet south of the middle anticline a rich belt of leads, called the Hattie belt, 21 feet wide, was worked by open-cut on the Gisborne property for a length of 360 feet and a depth of 110 feet, and more recently on the Griffin property. It was traced east 1,400 feet to a fault giving a horizontal displacement of 50 feet. The leads are interbedded and dip south 55 degrees to the depth of 110 feet where the strata curve abruptly in a synclinal fold and the quartz pinches out. To the south of this the strata are shown in a crosscut to dip north at a low angle with little or no quartz. This is one of the few instances in which rich veins have been found in a syncline in Nova Scotia.

Very rich float was found to the south of this belt and it probably came from another rich vein to the south of the Hattie belt. It also is probable that the rich drift found on Red head is derived from the north limb of the syncline, thrown this far south by the main fault and lying possibly in the vicinity of the McMillan and other belts cut along Sand cove.

Some prospecting has been done where rich drift was found on the south anticline and at Betty cove, but nothing of importance was found.

History

"Gold was discovered at Isaac Harbour on the 14th day of September, 1861, by Joseph Hynes, under the following circumstances. A young man by the name of Elias Cook had been at Wine Harbour mining, a short time previously, and had obtained some specimens of gold-bearing quartz. On his return to Isaac Harbour he observed a similarity in the rocks of the latter place to those of Wine Harbour, and, in company with Allan McMillan, commenced a search for gold, but found none. At length Cook dropped one of the Wine Harbour specimens, and McMillan in searching picked it up. They immediately returned home with the exciting intelligence that they had discovered gold, upon which a number of the inhabitants at once repaired to the spot; but after a fruitless search of several hours, returned disappointed. Joseph Hynes, however, on the afternoon of the same day, resumed the work of prospecting, and on what is called the 'free claim' in the west division obtained several fine specimens of auriferous quartz. On the same evening, John Lathan and others found several pieces of gold-bearing quartz on the Burke lead.

In the east division the first discovery was made by two Indians, on what is now called the 'Mulgrave lead', a short time after the discovery on the west side."[1]

In 1862 a number of leads had been more or less mined, the most important being the Mulgrave, Victoria, Burke, and Fraser leads. On the first of these fifteen shafts had been sunk, varying in depth from 15 to 60 feet, the deepest being Gallagher's pit. The average yield from this lead was 1 ounce 13 pennyweights, and the greatest yield 5 ounces 6 pennyweights of gold per ton of quartz. On the Victoria lead there were three shafts from which ore averaging 1 ounce 7 pennyweights per ton had been taken. Work on the Burke lead was limited, but the ore taken out averaged 2 ounces per ton, and 40 tons of quartz taken from the Fraser lead yielded 120 ounces.

Great progress was made in mining in this district in 1863 and the production was four times that of 1862. During this and the succeeding year the quantity of quartz crushed was not great, but it proved very rich. Steady and profitable operations were also carried on during 1865. In 1866 only two lodes were mined, the Mulgrave and the Victoria. The former was worked by Messrs. Gallagher and Company, who sank a shaft 230 feet deep and connected it by a level with a 238-foot shaft 100 feet to the east. Isaac Harbour Company mined the Victoria lode by two shafts 130 feet and 25 feet deep. Work continued during a part of the next year on these two lodes, but in 1868 the production fell to 673 ounces. Early in 1868 work on the Victoria lode was discontinued on account of the loss of the crusher by fire, but the Mulgrave lode was worked by the Mulgrave Company, which had acquired the Gallagher property. The Mulgrave vein, although about 6 inches wide, was found to swell to about 24 inches at a distance of 1,900 feet from the shore. This swell, which averaged 2 ounces of gold per ton, pitched to the west and this year it was found near the shore at a depth of 274 feet. Preparations were also made this year to carry on alluvial washing at the mouth of the harbour, where promising alluvial deposits were found.

The production of 1869 was only 227 ounces. The west shaft on the Mulgrave lode was deepened to 320 feet, but mining at this point did not prove a success. Some stoping was done in connexion with No. 3 shaft. Prospecting resulted in the discovery of some lodes north of the Mulgrave; and two shafts were sunk about 900 feet apart on a lode 437 feet south of the Mulgrave. The Mulgrave property passed this year into the hands of Hugh Allan of Montreal. Southeast of the Mulgrave a belt 20 feet wide and containing twenty-one quartz veins 1 inch to 10 inches thick was discovered in September and opened by Mr. Buckley. It was shown to be at least 600 feet long and some rich ore was taken out. On the Gisborne property on this belt preparations were made for erecting a crusher. The alluvial mining was not carried on this year, although the ground seemed promising.

---

[1] Report of the Chief Gold Commissioner, 1862, p. 12.

The production in 1870 was more than double that of 1869, but mining operations were not conducted on a large scale and it was not until after many years that the production of this district assumed any very noticeable proportions. This year the United Mining Association, Limited, erected a 15-stamp mill driven by waterpower, and in the autumn carried on extensive work by open-cut on the belt opened by Mr. Buckley and indicated on the plan as the Hattie belt. This company continued operations on the belt during 1871, but was troubled for a time by the influx of water caused by a cave-in of the walls of the large open-cut. A tunnel was made to carry off the water and mining was resumed by means of shafts and levels. This year the same belt was mined by means of shafts and levels by the Consolidated Mining Company, whose ore was crushed at the mill of the United Mining Association. These two companies did some work in 1872, but in the following year all mining was abandoned and the production fell to 37 ounces.

In 1874, work was resumed on areas 983 and 196, block 1, east division, and Mr. Hattie reopened the Consolidated Mining Company's mine, put the mill in order, and stoped some ore on the 120-foot level. The next year some surface material on the property formerly owned by the United Mining Association was profitably milled, and tributers met with success in mining some stringers in the belt. Another set of tributers did a little work on the Allan property, principally on a lead 80 feet south of the Mulgrave lead. Work was continued in 1876 on the Union and Consolidated areas on the south side of the belt, and the North Mulgrave lead was opened by three shafts on the Allan property on area 4, block 2. The only mining in the district in 1877 was on this lead, and this year an adit was started on the lead from the shore to reach the workings about 300 feet to the east. Work ceased in 1878 owing to lack of agreement among the owners, but was resumed in the autumn.

In 1879 work was carried on by Mr. Gallagher on the North Mulgrave lode by sinking shafts 80 feet apart and stoping to the west. The quartz was sent to Sherbrooke for treatment both during this year and 1880, and yielded about 2 ounces per ton. In 1881, this property was transferred to the Gallagher Gold Mining Company and preparations were made for erecting a 10-stamp mill and carrying on more vigorous operations.

In 1882 this new mill was running, and mining began. A shaft was sunk cutting the North Mulgrave lode at 360 feet, and at a depth of 260 feet a crosscut was driven to the Gallagher or Mulgrave lode on which levels were driven and stoping carried on. Operations of a systematic and vigorous character were continued by the Gallagher Gold Mining Company in 1883 and 1884 and very rich ore was mined. The returns for the latter year were 2,212 ounces of gold from 913 tons of quartz, and the total returns for this mine were 5,034 ounces from 1,978 tons. Work was continued in 1885, but on a smaller scale, and in 1886 there was little done in the district except some tributing.

Interest was aroused in 1887 by the discovery of a lead showing rich quartz on Hurricane island. The lead was opened by three shafts, 37, 70, and 100 feet deep, and during the following year was worked by the Island Mining Company and produced over 2,000 ounces of gold. Mining was actively prosecuted on the island in 1889 by the Palgrave Company under the management of H. K. Fisher, but owing to litigation work ceased in March the following year. In December, 1889, however, work was started by H. K. Fisher on the North Star property west of the harbour, and continued during 1890. Important operations were carried on in 1891 under the management of H. K. Fisher, and ore from the Burke and North Star lodes was crushed at the mill of the Rockland Gold Mining and Milling Company on the old Gallagher property. A little tributing was done on the latter property. Prospectors in the Skunk Den, a small valley lying in the eastern part of the district, were rewarded late in the year by the discovery of an auriferous lode, probably a continuation of the Mundic lode.

In 1892, some mining was done at Skunk Den, but the most extensive work was on the North Star property. This mine was closed for a part of the year, but after a reorganization of the company it was reopened under the management of Roderick

McLeod. At the time of the inspector's visit, thirty men were employed, a new 10-stamp mill was nearly completed, and the main shaft was down 400 feet. Work was continued here in 1893, and two new shafts were opened on new leads. This year the Skunk Den or Malloy mine was taken over by the Eureka Company and worked for a time under the management of W. F. Fancy. The North Star mine was closed in 1894, but R. McLeod had fourteen men prospecting on the property. Little else was done in the district, the Eureka Company reporting only 21 ounces from 56 tons crushed.

In 1895 six or seven men were engaged in prospecting on the North Star property, and a few men in taking out quartz from the roof of the North Star lead. Late this year the Griffin Gold Mining Company, under the management of P. J. Griffin, started operations on the Hattie lead, and in 1896, thirty men were employed, a 10-stamp mill was crushing ore, and 578 ounces of gold was extracted from 1,524 tons of ore. The Eureka Company also made small returns this year. In 1897, the Griffin Gold Mining Company did very little; but some work was done on the Burke lead in the western division by James McLellan.

The year 1898 saw a revival of industry in this district. The Hurricane Point mine was reopened by the Hurricane Point Gold Mining Company under the management of W. F. Fancy. About thirty-six men were employed, and by means of a 10-stamp mill, 1,933 ounces of gold was recovered from 3,025 tons of ore. The Skunk Den mine was also reopened and twenty-seven men were employed by the Economy Mining and Milling Company under the management of C. F. Andrews. The main shaft was 160 feet deep, levels were driven, and some ore taken out for crushing at the 5-stamp mill. The next year mining was conducted on both these properties. At the Economy mine a 10-stamp mill had been erected, fifty men were employed, the main shaft was deepened to 200 feet, and stopes carried 160 feet east and 200 feet west. At Hurricane point forty men were employed and mining was carried on at a depth of 350 feet on a fold pitching west 27 degrees.

In 1900 the Hurricane Point mine had reached a depth of 475 feet where the lead petered out Some ore was being taken from the roof and the management intended to close the mine soon. The company had sunk 20 feet on a well-mineralized lead 500 feet to the south. In January, S. Sweet and Company reopened the old No. 9 Mulgrave mine under the management of F. A. Sweet. The shaft was retimbered and sunk 45 degrees deeper, stopes were carried east 50 feet, and from 259 tons of ore, 204 ounces of gold was recovered. Returns were made by this company in 1901 also. In 1902 the Goldfinch lead was worked by the Goldfinch Mining Company under the management of W. F. Fancy, and 846 ounces of gold was extracted from 1,193 tons of ore. Work was resumed by Edgar Silver and other tributers on the Goldfinch property in March, 1909, and continued until July. From 393 tons of ore 288 ounces of gold was recovered.

In 1912 S. R. Griffin and Son recovered 606 ounces of gold from 3,238 tons of ore. The shaft was continued this year to a depth of 76 feet and from the bottom of the shaft a level was driven 350 feet east on an incline of 8 to 15 degrees.

The Stormont Gold Mining Company worked the Mulgrave lead in 1913 and 1914. Most of the work was done from No. 6 shaft which was carried to a depth of 430 feet. In 1914 a recovery of 708 ounces of gold was made from 2,257 tons of ore. In 1915 and 1916 a small amount of work was done on the Dung Cove lead and about 4 ounces of gold obtained from 150 tons of rock crushed. A shaft was carried to a depth of 70 feet and a drift run west 40 feet following two veins of quartz 5 inches and 10 inches wide. Crosscuts were driven 15 feet south and 115 feet north and at 12 feet from the shaft a 22-foot belt carrying many quartz veins was cut. In 1916 a test lot of ore was taken from the McMillan shaft on Sand cove. In 1927 the Victory Gold Mines, Limited, under the management of John W. Warner, took over a block of areas including the Goldfinch, Victoria, and Mulgrave leads and certain claims at Lower Seal Harbour. The workings were unwatered for purposes of sampling and a new shaft at Lower Seal Harbour was sunk to a depth of 100 feet. The workings on the Goldfinch were kept pumped out and at the time of the Inspector's visit in May, 1928, a new headframe was being erected. It was the intention of the company to unwater the South Mulgrave lead.

General Development

Little definite information is available concerning the development of this district except that shown on the published plan for which surveys were made in 1902. The close dependence of the pay-shoots of those veins already worked on rock structure, as described under the heading 'Character of the Deposits,' makes this a very suitable field for underground exploration by means of a vertical shaft and crosscuts. The crumple on the northern anticline along which the gold was concentrated in the veins exposed at the surface, no doubt extends to some distance in depth, and there is a possibility that this crumple has provided conditions suitable for the concentration of gold in the underlying, unexposed saddle-veins. As yet no other attempt has been made to explore and develop this succession of veins than that made a few years ago by the Hurricane Point Company, when operations were put under way, but were discontinued just as the crumple was being reached and the vein was improving in size and value.

LOWER SEAL HARBOUR

Geology and Ore Deposits

This lies about 2 miles east of Isaac Harbour. The Goldenville[1] formation is exposed, the strata striking north 59 degrees west and dipping northeast at angles varying from 65 degrees to 73 degrees.

The deposit consists of a wide belt of whin and slate, the former predominating, in which are a great number of quartz veins running roughly parallel with the bedding, but frequently cutting across and joining one another so as to form a great network. Each individual vein appears to have no great extent either in length or depth and the whole series has an echelon arrangement, each one overlapping and lying slightly to the west of the one immediately to the south. In depth a similar arrangement seems to hold, and each vein overlaps and lies a little higher than the one immediately to the south. Operations have been carried on chiefly on the Donkin belt, 27 feet wide, and to a less extent on the Slate and John Bull belts. It has been proved on the Beaver Hat property that the ore-body does not extend to any great depth. On the Partington property to the west the depth has not been proved, but so far as development work shows the ore-body does not appear to diminish in size on the western pitch. The rolls dip west 21 degrees in the Beaver Hat workings and 37 degrees in the Seal Harbour main shaft.

Gold is found in both the quartz and the country rock. Arsenopyrite occurs with a little galena in bunches, chiefly in the slate. Calcite is disseminated in small amounts, and in some places a considerable amount of feldspar is found.[2]

As has been already pointed out this deposit lies on the continuation of the Victoria-Goldfinch zone of fissures.

History and Development

In early years this district attracted attention on account of a line of rich boulders designated the Golden Stair, and extending from Cook cove to Seal Harbour lake, a distance of 2 miles. Much time was spent in the search for the source of this drift. The prospectors worked on the supposition that the rich vein was a cross vein, since many cross veins were found running north and south, the direction of the line of drift. The most noticeable of these is the 25-foot Pepper and Salt vein. In 1867, 1868, and 1869 the search was prosecuted, but without success. Later much surface tunnelling was done by Messrs. Penrose and Robert McNaughton, and in these explorations McNaughton discovered a cross vein at the head of Seal Harbour lake, after which he erected a crusher and did some development work. It was not until October, 1904, that the large belt was discovered, when Percy J. White opened three small leads that had previously been exposed by McNaughton, followed them up, and found them to be part of an auriferous belt. White's discovery was followed almost immediately by the discoverey of the same ore-body to the west by G. J. Partington.

---

[1] MacKenzie, T. G.: Jour. Min. Soc., N.S., vol. XII, p. 66.

[2] Op. cit.

In 1905 two companies were carrying on mining operations, the Beaver Hat Gold Mining Company, Limited, and the Seal Harbour Mining Company. By the former company a shaft was sunk 55 feet and at a depth of 35 feet crosscuts and short levels driven, and a 5-stamp mill was erected. The Seal Harbour Mining Company, under the management of G. J. Partington, sank a 65-foot shaft a few feet west of the Beaver Hat property, and at a depth of 35 feet drove a crosscut south 87 feet. Another shaft was sunk 70 feet west and connected with the crosscut by a level. A 10-stamp mill and a Wilfley concentrator were erected by this company.

Operations were active at both mines in 1906. At the Beaver Hat, under the management of S. C. McLean, a three-compartment shaft on the eastern end of the property was sunk 100 feet, and levels were driven, but little stoping was done. The Seal Harbour Mining Company had thirty-five men employed early in the year. The west shaft was deepened to 120 feet, at a depth of 100 feet a crosscut was driven south 67 feet, and at 27 feet and 47 feet from the shaft in this crosscut levels were driven. Work ceased in May and the mine was allowed to fill.

At the Beaver Hat mine twenty men were employed in 1907. The 90-foot level was extended and 625 ounces of gold was recovered from 1,936 tons of ore. A new 10-stamp mill was erected this year. Work was continued to the latter part of May, 1908, when the mine was closed, the production being 624 ounces from 2,670 tons. The 50-foot level was extended east 50 feet and stoping was carried on between this and the 80-foot level.

The Seal Harbour Mining Company's property was taken over by the Seal Harbour Leasing Company under the managership of D. McAskill. In 1911 and 1912 ore was stoped from the Big belt above the 100-foot level. In 1911, 1,741 ounces of gold was recovered from 5,190 tons of ore; and in 1912, 117 ounces from 700 tons. Further work on the Big lead was carried on in 1914 and 1915 above the 100-foot level and in 1915, 132 ounces of gold was recovered from 641 tons of ore. In 1927 the Victory Gold Mines, Limited, took over the Percy J. White claims and sank a new shaft 100 feet deep on the Dan belt. In 1928 a level had been driven west 200 feet at a depth of 100 feet. At a point 100 feet from the shaft crosscuts on this level had been driven south 227 feet and north 18 feet, at two points raises had been made 62 feet, and from the tops of these exploratory crosscuts had been driven, but little or nothing of value had been found.

Production of Stormont[1]

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1862	397	0	0	197	2	0	7
1863	1,587	13	12	526	3	0	7
1864 (9 months)	1,049	4	21	391	2	13	16
1865	1,999	0	2	1,122	1	15	15
1866	1,055	7	13	1,956		10	19
1867	1,505	2	11	1,149	1	6	5
1868 (15 months)	792	12	17	690	1	2	23
1869	227	0	13	590		7	16
1870	578	5	15	1,525		7	13
1871	559	7	21	1,937		5	18
1872	472	0	11	543		17	9
1873	37	18	5	181		4	4
1874	167	19	20	236		14	5
1875	267	6	18	620		8	14
1876	267	0	5	370		14	10
1877	240	19	0	96	2	10	4
1878	106	10	0	74	1	8	19
1879	198	15	0	124	1	11	6
1880	347	12	0	175	1	19	7
1881	173	10	0	80	2	3	9

---

[1] This comprises Isaac Harbour, Upper Seal Harbour, Lower Seal Harbour, Country Harbour, and Forest Hill

Year	Gold extracted			Ore Crushed	Yield per ton of 2000 lbs.		
	Os.	Dwt.	Gr.	Tons	Os.	Dwt.	Gr.
1882	903	17	16	511	1	15	9
1883	1,917	3	0	551	3	9	9
1884	2,212	8	1	913	2	8	10
1885	863	15	10	707	1	4	0
1886	435	0	0	429	1	0	6
1887	293	15	22	663		8	20·7
1888	2,222	6	0	1,904	1	3	8
1889	1,745	6	0	2,925		11	22
1890	616	15	12	1,052		11	17
1891	957	3	4	829	1	3	2
1892	2,482	11	2	3,625		13	18
1893 (9 mos. ending Sept. 30)	3,451	19	8	7,570		9	2
1894 (year ending Sept. 30)	1,980	4	18	6,628		5	23
Corrected returns which were too late for publication give for year ending Sept. 30	5,402	13	17				
1895	4,225	6	11	16,582		5	2
1896	5,076	0	1	22,946		4	10
1897	6,209	18	10	28,700		0	13
1898	8,386	17	2	34,817		4	16
1899	8,099	1	12	32,794		4	22
1900	7,745	18	10	28,238		5	11
1901	5,139	17	0	30,228		3	10
1902	6,290	1	18	35,906		3	13
1903	3,094	1	12	20,331		3	1
1904	1,037	8	5	11,767		1	18
1905	3,316	6	16	28,882		2	7
1906	7,114	9	11	42,431		3	8
1907	7,582	10	0	45,627		3	8
1908	5,835	15	0	41,793		2	19
1909	6,185	15	0	42,617		2	21
1910	4,075	12	1	36,978		2	5
1911	2,615	2	19	5,733		9	2
1912	806	3	0	4,263		3	19
1913	8	6	0	20		8	7
1914	707	14	0	2,257		6	7
1915	1,479	4	19	1,594		18	13
1916	677	14	20	579	1	3	10
1920	3	13	0	Plates			
	127,824	9	12	556,167½			

KEMPTVILLE

Kemptville gold mines lie in Yarmouth county, 23 miles northeast of the town of Yarmouth, 16 miles north of Tusket station on the Halifax and Southwestern railway, and 12 miles from Brazil station on the Dominion Atlantic railway.

The veins,[1] which are mostly of the interbedded type, occur in the Goldenville series. The most productive have been the Cowan lead on the Cowan property in the western part of the district and the Black lead on the Kempt property in the eastern part of the district. The Cowan lead, which was from 11 to 16 inches wide, was worked for a length of 200 feet by four shafts, 32, 165, 75, and 75 feet in depth. The vein is intersected by a fissure vein known as the Nash vein. At a depth of 150 feet on the Cowan lead crosscuts were driven 150 feet north and 50 feet south. A few veins were cut but were not worked.

The most important work on the Kempt property was done from a vertical shaft 275 feet deep. The ore was taken mostly from the Black lead, above and below its intersection with the Nash lead as well as from the Nash lead. The Black lead averaged 14 inches in width and the Nash lead was very irregular in size and direction.

---

[1] Faribault, E. R.: Geol. Surv., Canada, Sum. Rept. 1919, pt. F, pp. 10-14.

The total length of the workings in 1919 was about 200 feet. From the 80-foot level in the vertical shaft 180 feet of crosscutting was done. Ten veins were opened 125 feet east of the vertical shaft and work was done on the Boreo, Nash, and Pompeii leads lying north of Black lead and on the Galena, Reeves, and New leads lying south of Black lead. The Boreo, which is 4 to 8 feet wide, and the Pompeii, which is a large belt of leads, were enriched at their intersection with the Nash lead. The Galena lead is 12 inches wide. A shaft was sunk 100 feet on the Boreo lead and at a depth of 90 feet a crosscut was driven north 55 feet cutting the Pompeii lead and south 45 feet cutting the Nash and Black leads. In 1919 the development work on the Galena lead extended to a depth of 70 feet, but did not reach the intersection of the Nash lead.

Gold was first discovered in 1881 by James Reeves and Joseph Reeves on area 86, block 2. In 1885 the district received considerable attention and for three years ore of very high grade was crushed; in 1885, 624 ounces was obtained from 133 tons of ore; in 1886, 231 ounces from 56 tons; and in 1887, 255 ounces from 106 tons. The grade of ore then fell off, but from 1885 to 1918 a total recovery of 3,134 ounces was made from 4,418 tons. In 1927 the Bower Mining Company, Limited, carried on surface and underground exploration. No. 1 vertical shaft was carried to a depth of 160 feet, a crosscut at the 150-foot level was driven south 203 feet and north 232 feet, and at a point in the south crosscut 170 feet from the shaft levels were driven on a lead 68 feet east and 64 feet west. Work at No. 1 shaft was suspended and No. 2 shaft on the Desaulnier lead was deepened to 75 feet and at this depth levels were driven east and west at least 80 feet. Some exploratory work was done on a discovery of galena at Snare lake.

Production

Year	Total yield			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1898	109	15	5	228		9	15
1902	389	17	0	515		15	3
1903	205	13	0	411		10	0
1904	8	15	0	130		1	8
1905	87	16	0	120		14	15
1906	8	6	0	60		2	18
1910	52	6	0	52	1	0	3
1911	16	6	0	25		13	1
1915	2	15	0	3		18	8
1916	25	17	0	14	1	16	19
1917	38	17	0	3	12	19	0
1920	2	15	0	Assay			
1925	4	15	0	3	1	11	16
1926	1	10	0	2		15	0
1927	1	0	0	4		5	0
	956	3	5	1,570			

KILLAG[1]

Location

Killag gold district lies in the eastern part of Halifax county on Killag river, a tributary of West river, Sheet harbour. It is 10 miles north of the village of West River Sheet Harbour from which it can be reached by a wagon road. West River Sheet Harbour is reached by packet from Halifax or by stage from Shubenacadie.

Geology

The Goldenville formation is exposed here in an anticline running south 79 degrees east (magnetic). It plunges to the east at a low angle, probably about 25 degrees, like the corrugations in the veins. The strata on the south side of the axis strike east (magnetic) and dip nearly vertically, whereas the strata on the north side strike south 55 degrees east (magnetic) and dip to the north at an angle of 35 degrees. There has been very little faulting in any magnitude. Unfortunately a large part of the district that it would seem advisable to prospect thoroughly is covered with a swamp, and exploratory work accordingly costs too much to be carried on very extensively.

---

[1] Plan published.

Character of the Ore Deposits

The veins are of the interbedded type and follow the planes of stratification around the apex of the anticline. They are found to be larger and more numerous on the apex of the fold than at a distance from it. Only a few veins have been worked, but productive ore has been taken from both sides of the fold. The two veins that have received the most attention are the Flat lead on the north limb and the Stuart lead on the south limb. The Flat lead, 4 inches thick, lies on the hanging-wall of a 4-foot slate belt, and about 10 inches of the slate adjacent to the quartz is auriferous. The vein occurs in rolls dipping east at a low angle and the greater proportion of the gold is confined to the bottom of the rolls. The Stuart lead on the south limb is 10 inches thick and has a dip nearly vertical.

History

The early history of this district consists of the story of efforts to find the source of very rich drift, efforts which were finally rewarded in G. W. Stuart's discovery of a highly auriferous quartz lead in 1889 after a pertinaceous struggle of several years.

During[1] the years 1865-8, quartz boulders were found so rich in gold as to induce Leopold Burkner, who was operating extensively in Waverley, to spend considerable money in an attempt to find the vein. He took in a 10-stamp mill, spent several months in fruitless prospecting, and then took the mill out again without having erected it.

Late[2] in the seventies or early in the eighties the discovery of more rich boulders aroused some excitement and Peter Dunbrack and some associates secured 95 areas. They erected a 5-stamp mill and prospected three years, spending $12,000 without finding the rich vein.

In 1884 these areas were acquired by G. W. Stuart and associates. Mr. Stuart personally managed the operation that finally led to success. After careful examination of the ground and after considerable surface work he came to the conclusion that the source of the rich drift lay near the centre of the swamp. Several unsuccessful attempts were made to sink in this swamp, but finally by means of caissons Mr. Stuart succeeded in reaching bedrock after passing through 25 feet of peat, quicksand, and boulders. Continuing the shaft 35 feet in the solid rock, and then crosscutting 60 feet he discovered in 1889, a 10-inch vein showing an abundance of free gold. This is the vein marked on the published plan as the Stuart lead. A crusher was erected and some ore taken out.

In 1890 the property was sold to a Boston syndicate of which H. S. McKay was president and general manager, and a 10-stamp mill was erected. In December,[3] 1890, 51 ounces of gold was extracted from 45 tons of quartz, and during the first nine months of the following year 354 ounces were extracted from 378 tons. In 1894, the work was in charge of D. S. Turnbull; in 1896 only 20 tons of quartz was milled, but this yielded 123 ounces of gold; in 1897 and 1898 mining was more active and work was done on the Flat and Stuart leads.

In 1897, Robert Hall and others did some prospecting, sank a shaft on a vein dipping 35 degrees, and drove levels. In 1899, this property, known as the Little Klondike mine, was under the management of A. Clattenburg, and ore was crushed at the mill of H. S. McKay, whose company was known as the Old Provincial Gold Mining Company. The next year the Little Klondike was worked on tribute by Messrs. McPhee and Cox, and since then the district has received little or no attention.

In July, 1909, however, work was resumed here for M. J. O'Brien, but up to October it was limited almost wholly to surface prospecting. At the end of the year the main shaft on the Klondike lead had been pumped out preparatory to commencing underground work. This work was continued in 1910 and two tests were taken from the Klondike lead. A yield of 59 ounces of gold was obtained from 74 tons of ore milled. In 1925 and 1926 a few tons of ore carrying about 3 ounces a ton were taken by Geo. A. Cameron from what is known as the Flat lead. This lead averages 12 inches in thickness and dips north at an angle of 25 degrees.

---

[1] Trans. Min. Soc., Nova Scotia, vol. XI, p. 60.

[2] The Critic, Sept. 27, 1889.

[3] Industrial Advocate, Ap., 1900, p. 14.

General Development

In 1897 the main shaft on the Stuart lead was 176 feet deep, and at this depth levels had been driven east 84 feet and west 169 feet; a crosscut driven south 99 feet cut 5 veins from 1 to 10 inches thick, and one driven north 134 feet cut the anticlinal axis at 113 feet, and five veins ranging from a few inches to 10 inches in thickness. A vertical shaft was sunk 115 feet north of the anticlinal axis, cutting the Flat lead at a depth of 26 feet. It was then sunk on the dip of the vein, 35 degrees, to a depth of 110 feet. Levels were driven east and west 80 feet and quite a little stoping was done.

As much auriferous drift has been found for some distance along the course of the anticline, further prospecting may expose other paying veins. It has also been suggested that a vertical shaft sunk to some considerable depth about 100 feet north of the axis would probably cut a succession of low-dipping veins in those parts where they start to curve around the apex of the fold and where the rolls would be the most numerous and richest.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1891	354	6	16	379		18	11
1897	393	19	0	112	3	10	8
1898	556	8	0	355	1	11	8
1910	59	13	0	74		16	3
1925	22	5	0	7	3	3	13
1926	25	16	0	9	2	17	8
	1,412	7	16	936			

LAKE CATCHA[1]

Location

Lake Catcha gold district is situated in Halifax county, near the Atlantic coast, on the peninsula between Chezzetcook and Port Petpeswick harbour. It is 6 miles from Musquodoboit harbour, which is reached by stage coach from Halifax, a distance of 31 miles. Since the district is only 2 miles east of the village of East Chezzetcook it was frequently designated Chezzetcook, especially in the early days.

Geology

The Goldenville formation[2] is exposed in an anticline running north 74 degrees east (magnetic) and plunging to the east at an angle of 25 degrees and to the west at an angle of 28 degrees, thus forming an elongated dome. The strata on the south side of the axis dip south at a low angle, increasing to 45 degrees at a distance of 500 feet to the south, whereas on the north side the dip increases more rapidly and reaches 80 degrees at a distance of 500 feet. Numerous faults cross the district and produce displacements that frequently interfere with mining operations, but the most of them have been accurately located and mapped. Those in the eastern part of the district are left-hand faults; those in the western part are right-hand. Among the most important may be mentioned a right-hand fault on the Anderson property running northwest and dipping southwest at an angle of 20 degrees, also a prominent right-hand fault in the west end of the district, not accurately located, but probably following Petite Mare brook about north 25 degrees east.

---

[1] Plan published.

[2] Faribault, E. R.: Geol. Surv., Canada, vol. XI, pt. A, p. 155.

Character of the Deposits

The most of the veins lie in the bedding planes, but two cross veins have proved auriferous. All the veins developed lie on the north limb of the anticline, and some of these, like the Coleman, Mill, and Iron leads have been traced over a mile on the strike.

"In[1] looking over the plan of the district, we find that most of the best streaks on the Coleman, Mill, Battery, Lake, and Sheba leads are situated along a well-defined zone. This zone leaves the anticlinal axis at the west end of the district, where rich drift has been discovered northwest of the Petite Mare bridge, on the Cogswell areas, and from there it runs north 60 degrees east. It, therefore, intersects the veins at an angle of 14 degrees, until at the eastern end of the district it is found 1,400 feet to the north of the axis."

The gold is concentrated in shoots, which have been worked chiefly on the Coleman, Mill, and Battery leads on the Oxford property, and on the Lake and Sheba leads on the John H. Anderson property. The late J. M. Reid, while in charge of the Oxford mine, kept records and plans of the underground workings on the Coleman vein which showed that there are three well-defined pay-shoots in this vein lying in undulations below one another and dipping at low angles.

Two interesting cross veins have been developed in this district, the Cooper and the Cogswell. The former lies 3,000 feet north of the anticline in the northwest part of the district and cuts the bedding in a northeast direction in the manner of an angular, following a slate bed a short distance and then cutting nearly perpendicularly across a bed of quartzite, only to follow a slate bed a short distance on the other side. It varies much in size, reaching 4 feet in places, and the gold and sulphides appear to be concentrated along certain beds of slate. The Cogswell "angular," in the eastern part of the district, also has a northeast direction, and is richest at its intersection with interbedded veins.

History

Although a discovery of gold was reported in 1865, it was not until 1881 that much attention was given to the district. It[2] is claimed that the discovery that led to results was made by J. H. Anderson, who opened several lodes west of lake Catcha, and who figured prominently in the history of the district.

In 1876 a lead that had been worked 10 years previously was reopened, and a trial lot of ore crushed at the Lawrencetown mill gave over 1 ounce per ton. A trial lot was crushed at Lawrencetown the next year, and another lot in 1879. In 1878 strong interest was taken in some leads, which, however, failed to justify the hopes of the prospectors. Auriferous leads were discovered in 1880 and others were opened in 1881. On J. H. Anderson's property seven lodes from 5 to 18 inches thick were opened, and on Dr. Cogswell's property prospecting met with favourable results; on the McLeod property a 4-foot lode was cut in addition to a belt of promising lodes.

In 1882 the Oxford Gold Mining Company had acquired a number of areas north of the lake, erected a 10-stamp mill, and pushed work so vigorously that it had become established as a steady producer. For many years this company continued steady operations under the management of J. M. Reid and made this for a time one of the best producing districts of the province. In 1883 and 1884, operations were confined principally to this mine and the yield was good, most of the ore being taken from the Mill and Coleman leads on which mining was carried to a depth of 100 feet. Work continued here during 1885 and 1886, and in 1887 the Battery lead was worked, which although only about 1 inch thick proved remarkably rich in coarse gold. The Split lead was rediscovered this year and preparations were made to work it; in July an angular was cut on the property which gave very rich ore on the surface. Ore was taken from Split and Picayune leads in 1888, and a little work was done on the Battery lead. The Oxford Gold Mining Company spent most of 1889 in prospecting. Lake Catcha was partly drained and several leads that were never worked were rediscovered on the north shore. Other trenching cut numerous veins. A roll was also discovered on the Coleman lead near the east end of the property. Returns were made from this mine during the first part of 1890, but little was done during the autumn. In 1891, thirty-one men were employed under the management of J. M. Reid, and the next year twenty-two men were employed. During 1892 and 1893, a large quantity of surface material was put through their 10-stamp mill in addition to the quartz from the Coleman lead. Work continued on the Coleman lead in 1894 and at the end of that year J. M. Reid, who had so ably managed the Oxford mine for 10 years, was forced through ill health to quit work. In July, the following year, he died. A table of the official returns from this mine is given in the *Canadian Mining Manual*, 1897, page 190, as follows:

---

[1] Geol. Surv., Canada, vol. XI, pt. A, p. 150.
[2] The Critic, Dec. 18, 1891.

Year	Rock crushed	Gold yield		
	Tons	Oz.	Dwt.	Gr.
1882	615	1,017	2	3
1883	1,472	2,575	15	19
1884	2,287	2,019	19	0
1885	1,670	1,094	14	0
1886	492	1,683	18	15
1887	886	3,050	2	0
1888	1,559	2,161	15	0
1889	767	588	2	0
1890	901	779	5	0
1891	2,177	580	8	0
1892	2,124	764	7	14
1893	1,646	811	0	0
1894	1,643	944	18	0
1895 (6 months)	396	100	16	0
1896 (3 months)	90	31	19	0

The history of Lake Catcha district has been to a large degree the history of the Oxford Gold Mining Company, so far as production is concerned, but there have not been wanting earnest and persistent efforts to develop important mining enterprises in other parts of the district.

In 1882, Messrs. Stather, McKay, and Vaughan all made discoveries to the north of the Oxford property, and prospecting was done also by Dr. Cogswell and Messrs. Weston, McLeod, and others. In 1884, preparations were made to build a mill on the Cambridge property to the west of the Oxford property. For several years some prospecting and exploratory work was done on properties adjoining the Oxford property. In 1889 J. H. Anderson did considerable prospecting and commenced development work on one of the many lodes discovered. Some work was done also on the Cogswell and Cambridge areas, the Cambridge mill doing a little crushing. In 1891, Anderson erected a 10-stamp mill west of the lake and got favourable returns from his mining operations. The next year he had twelve men employed on the Lake and Barker leads, and a Wm. Carl was engaged in working the Cogswell angular. In 1895, J. H. Anderson employed seventeen men on the Lake lead and a shaft was sunk 100 feet deep. This year[1] or late in 1894 the Oxford Gold Mining Company was incorporated to carry on mining on the property of the old Oxford Company, and G. J. Partington became manager. Crushing was reported from this mine in 1895 and 1896. In 1898 development work was done in the district and some of the old mines were reopened, J. H. Anderson being among those who resumed work. The next year he had twelve men working on the Sheba lead and doing development work north of the shaft. F. W. Hanright also started a shaft a short distance west of the Anderson property on what is supposed to be the Sheba lead.

Some exploratory work was carried on by Messrs. Anthony, Cooper, Hanright, and others and a 15-stamp mill was erected by J. B. Neilly on the Cooper fissure vein north of the district.

Eighteen men were employed in 1900 at the Hanright mine under the management of Mark Anthony. Shafts were sunk on the Sheba lead, some stoping was done, and a few shafts sunk on other leads. Much development work was done and the

---

[1] Can. Min. Man., 1897, p. 190.

Cogswell 10-stamp mill was removed and erected on this property. The Oxford Mining Company carried on mining operations on the Twin lead and on another lead 80 feet north of it. This year, J. H. Anderson sank a shaft on the Split lead, and tributers did some work farther west. The next year only a small amount of work was done on the Anderson property; W. Dukeshire sank a shaft on the Sheba lead south of the mill; G. E. Franklyn had a few men prospecting for the Oxford Gold Mining Company, and Mark Anthony continued work with thirty-five men for the Lake Catcha Consolidated Gold Mining Company. The principal work was done on the Mark Anthony lead, where shafts were sunk and some stoping done.

In 1902, J. H. Anderson worked the Split lead; the Fraser angular was picked up by J. H. Johnson who had a bond of the old Cambridge property; and operations were continued on the Hanright property.

Nothing further is recorded of this district in the reports of the Department of Mines, Nova Scotia, until 1907, although operations had not ceased. J. H. Anderson had been working various leads, and in 1907 extracted 166 ounces of gold from 85 tons of ore. Work was resumed on the Hanright property in July, 1907, and mines on the Sheba and Anthony leads were pumped out. The next year tributers reported 219 ounces of gold from 106 tons of quartz taken from the Anderson and Hanright properties. On the Oxford property work was recommenced in August, 1907, under the management of G. J. Partington; the Lake lead was pumped out and some sinking done. In July, 1908, work was commenced by the Oxford Mining Company on the Coleman lead, preparatory to carrying on extensive operations. In 1909 the Petpeswick Mining Company, G. J. Partington, manager, carried on extensive development work on the Lake and Coleman leads, having taken over the Oxford and J. H. Anderson properties. No stoping, however, was done, and the mill was not started.

In 1910 the same company extended the 460-foot level upon the Coleman east 182 feet to a total length of 314 feet. The south crosscut was extended 80 feet to 156 feet, cutting the Battery Twin, South Battery, and Mill leads. Levels were driven east 30 feet upon the Battery Twin and 27 feet upon the South Battery. A crosscut was made from the face of the drift on the South Battery to the Mill lead, and a 20-foot drift east made upon the Mill. From the east drift on the Coleman lead 210 feet east of the shaft a raise was made 62 feet and from the same level 270 feet east of the shaft a raise was made 18 feet. In May work was discontinued upon the Coleman and operations transferred to the sinking of a new vertical shaft upon the Lake lead, 160 feet west of the one sunk in 1909, 150 feet south of the old Anderson shaft. This shaft reached 80 feet in depth. West of it upon the same lead above the fault, the west Anderson shaft was cleaned out and sunk an additional 52 feet to 80 feet. The east Anderson shaft was unwatered, enlarged, and retimbered. In 1911 the new vertical shaft upon Lake lead was sunk an additional 130 feet to 210 feet in depth. The Lake lead was encountered at 173 feet. At 200 feet a level was driven 50 feet east, 862 tons of ore were mined and milled, yielding 320 ounces gold. In 1912 the 200-foot level upon the Lake lead was extended 116 feet east to a total length of 166 feet. Stoping was done above this level. Work on this vein was discontinued in February, and operations transferred to the Coleman lead. At 300 feet upon the Coleman a level was driven east 247 feet and west 297 feet. Stoping was done on the east drift. From the west drift 35 feet west of the shaft a crosscut was made south 65 feet upon the 7-foot fault. The Coleman showed from 3 to 14 inches in width, averaging about 6 inches. Fifteen hundred and seventy-two tons of ore was mined and crushed, yielding 162 ounces gold. In 1913, the 300-foot level upon the Coleman was continued 113 feet east to 360 feet. The level was driven west 57 feet to a total distance of 354 feet. The crosscut from this level 35 feet west of the shaft was continued to 420 feet in length. Eleven leads were cut, varying in thickness from ½ to 4 inches. An area 200 feet long by 100 feet high was stoped from the east drift. Eleven hundred and eighty-five tons of ore was mined and milled, yielding 354 ounces gold. In 1914 a new shaft on the Picayune lead was sunk 26 feet. The lead was worked through the crosscut from the 300-foot level of the Coleman shaft. At the surface the Picayune is 3 inches thick; at the 300-foot level it is 10 inches thick at the end of the 80-foot west stope and 1 inch thick at the end of the 110-foot east stope. The pay-streak appears to dip to the west; the working belt is 5 feet thick. Eleven hundred and six tons of ore was mined and milled, yielding 387 ounces gold. In 1914 J. B. Neilly began the erection of a mill upon the Cooper angular.

In 1915 the Petpeswick Mining Company sank a vertical shaft on area 140, block 2, to a depth of 92 feet, and a crosscut 159 feet from the foot was driven southeast under the Water Hole lead at the west end of Lake Catcha district. The ground was found broken by numerous faults; ten cross veins, varying from 1 inch to 4 feet of quartz, were cut; the assays were very low. Later in the year two tributers started work; W. S. Crook sank upon the Picayune lead on area 116. The vein was found to be from 1 to 1½ inches wide. C. Pettipas worked on the Mill lead on area 193. He reopened an old shaft 50 feet deep. The vein shows 1 inch wide, varying through the workings from 3 to 4 inches. Andrew Smith sank a test shaft 30 feet deep upon the Cogswell angular on area 204. Forty-four tons of ore were mined and milled, yielding 101 ounces, 10 pennyweight, 7 grains. In 1916 a small amount of work was done by C. P. Pettipas. Twelve tons of ore was mined and milled, yielding 23 ounces, 12 pennyweights of gold. In 1917 the Alpha Gold Syndicate took over what was formerly known as the F. W. Hanright property. Two shafts, 30 and 46 feet deep, were sunk upon the Bull lead. In 1918 the Alpha Gold Syndicate continued prospecting upon the Hanright property.

General Development

The published plan sums up nearly all the available information on this point giving the location and depth of the various shafts. The new shaft started in 1909 on area 130 about 150 feet south of the old Anderson shaft has been sunk 132 feet, and a level driven 50 feet east. The shaft in the Coleman lead, area 215, was continued to a depth of 485 feet, and at a depth of 460 feet levels have been driven east 132 feet and west 20 feet. From this level and from a point just west of the shaft a crosscut that has been driven south 76 feet intersected the Garden lead at 40 feet and the Whinbound at 65 feet.

There is much good ground still unexplored on the surface along the line of the pay-zone described above. Should an attempt be made to test the depth of the pay-zone it would be well to consider the probability of its dipping at the same angle as the anticlinal axial plane south 75 degrees so that crosscutting at depth should be carried to the south.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1887	2,959	4	0	601	4	18	18
1888	2,284	17	3	1,611	1	8	2
1889	607	10	0	807		15	1
1890	779	5	0	1,008		15	10
1891	800	3	0	2,432		6	13
1892	1,046	18	16	2,467		8	11
1893 (9 mos. ending Sept. 30)	734	10	0	1,361		10	18
1894 (year ending Sept. 30)	1,715	6	0	2,387		14	8
1895	858	15	7	1,501		11	10
1898	396	16	11	406		[illegible]	12
1899	678	16	16	1,127		12	1
1900	507	3	6	756		13	10
1901	969	16	21	1,779		10	20
1902	554	8	11	1,037		10	17
1903	472	11	8	677		13	23
1904	113	13	15	97	1	3	11
1905	64	18	15	56	1	3	5
1906	231	18	0	282		16	11
1907	177	11	20	90		19	11
1908	219	1	14	106	2	1	8
1908	5	17	10	(Mortared)			
1911	320	5	8	863		7	10
1912	161	19	2	1,572		2	1
1913	353	10	9	1,185		5	23
1914	387	13	23	1,106		7	0
1915	101	10	7	44	2	6	3
1916	23	0	11	12	1	18	9
1921 (mortared)	31	0	0				
1925 (mortared)	1	0	0				
	17,559	12	17	25,370			

LAWRENCETOWN[1]

Location

Lawrencetown gold district is situated in Halifax county at the junction of Partridge and Salmon rivers near the head of Lawrencetown lake. It lies about 12 miles east of the city of Halifax from which it is accessible by a good wagon road.

Geology

The Goldenville formation is brought up by two anticlinal folds which approach each other in this district and thus give a remarkable width to the auriferous zone. These two folds converge from the east and at the foot of Echo lake are 1,800 feet apart, the most northerly crossing the lake 1,600 feet north of the Mill Brook outlet and the other crossing this brook 200 feet below the outlet. "The[2] syncline between these two anticlines runs down Echo river to the dam, coalescing towards the west with the southern anticline and terminating on the Shanghai property . . . One main fault has been located running down Partridge river in a southeast direction to the Lawrencetown lake, with a horizontal shove to the south of some 200 feet, on the east side of the line; and two other right-hand faults were established to the west, parallel with it, with displacements of about 90 and 17 feet, respectively." Other subordinate faults have been discovered during mining operations and are indicated on the plan of the district.

Character of Deposits

The auriferous zone is an area over a mile long and nearly half a mile wide. The veins lie in the stratification planes, the most important being the Wadlow, Middle, Bennett, Werner, Nickie, Belt, and Vance. Those that have been developed to the east of Partridge river are situated on opposite sides of the syncline, and the northern auriferous zone west of the river lies at about the meeting of the middle syncline with the south anticline. Another zone including the Belt and Vance leads lies 1,500 feet to the south. The structure of the Belt lead is indicative of a subordinate crumple. Between these two auriferous zones a few veins have been opened.

History

Gold[3] was discovered here by William Brooks in May, 1861. Some years before this he had discovered what he supposed to be gold, but, being ridiculed by his father, he threw the specimen away. When the excitement arose over the discoveries at Tangier he searched near the mill dam where the discarded specimen had been found and succeeded in finding several nuggets of gold. The district was surveyed into lots in 1861.

In 1861 and 1862 some forty distinct veins were opened, all of which proved auriferous, and two crushers were erected driven by waterpower. These were inferior mills and had to be abandoned later. At Mr. Teare's mill 100 tons of quartz was crushed, but the yield is not known. One lot of 900 pounds yielded 4¾ ounces, and it is estimated that the production for 1862 was 75 ounces.

Some placer mining was tried in 1862, and the drift, which lies from 5 to 20 feet thick on the slope rising to a height of 150 feet on the west side of the river, was tested. In many places gold was obtained by washing the surface gravel, but the value was found to decrease on nearing the bedrock.

Little else than prospecting was done in this district until 1866, when a Mr. Strange did some sinking and tunnelling and Messrs. Wadlow and Company opened two lodes 15 feet apart and did some stoping. The next year the Wadlow property passed into the hands of Messrs. Townsend and Company and several lodes to the east of this were opened by Mr. Werner, shafts were sunk, among which was one 54 feet deep, and some drifting was done. Two mills were erected this year, one by Mr. Werner and one by Messrs. Townsend and Company. Mr. Strange ceased operations on the lodes worked in 1886, and directed his attention to some lodes east of the river, and to some to the west of Townsend and Company's areas. Later[4] in the year the Townsend and Strange and other properties were acquired by Messrs. Geo. B. Capel and Carlos Pierce, two promoters representing Montreal capital. The failure of their venture through unskilful and extravagant management did much to hinder the progress of mining in the district.

---

[1] Plan published.

[2] Faribault, E. R.: Geol. Surv., Canada, vol. XI, pt. A, p. 154.

[3] Heatherington, A.: "Guide to the Gold Fields of Nova Scotia", p. 39.

[4] Industrial Advocate, Aug., 1899, p. 16.

In 1868, Mr. Strange continued explorations on the east side of the river, but Mr. Werner was the most active operator of the district. He sank three shafts on the Nickie lead, 60, 50, and 40 feet deep, respectively, and stoped out a portion of the ground, and a shaft was sunk 54 feet on the 3½ foot mispickel lead to the north and one 55 feet on the Shaw lead a little farther north. The next year this property was worked by the Westminster Gold Mining Company. Considerable progress was made. A new 10-stamp mill was erected, with room for ten more stamps, and while it was being erected work was continued on the Nickie lead. The deepest shaft was continued to a depth of 90 feet, the lode was stoped a distance of 170 feet, and a new shaft was sunk 62 feet in the centre of a belt of lodes. Notwithstanding these extensive preparations the mine closed down early in 1870.

After this mining in this district was almost completely suspended for some time. Some tributers took hold of the Wadlow lead in 1872 and made preparations to work it, but little seems to have been done.

Late in 1875 Mr. Crooks started work on the Cross lead, area 294, which cuts the Crooks lead and continued during the following year. The Crooks lead, indicated on the plan as the South Slate lead, was the first one discovered in this district and is by the roadside near the lower bridge. The ore was crushed at the Crooks mill by waterpower, a mill that originally belonged to the Westminster Company, and was moved to a position near the sawmill that both might be driven by the same water wheel. The Cross lead yielded from 1 to 3 ounces per ton. This lead was worked a little in 1877, and in 1878 Mr. Crooks opened on the east side of the river the main lead which on the west side is cut by the Cross lead. In 1879, Mr. Crooks did a little work on his areas near the bridge and the following years crushed a few trial lots from different localities.

In 1877, some tributers on J. H. Townsend's property did some profitable mining on area 280 or thereabouts on the 'throw' of a large lead, but later in the year Mr. Townsend resumed control of his property. After this succeeded a long period of inactivity and with the exception of a little prospecting nothing was done until the latter part of 1897, when work was resumed on the Wadlow lead and carried on for about three years.

In 1899 five men were employed by the Shanghai Gold Mining Company, Limited, under the management of J. H. Townsend, on the old Wadlow or Townsend property. The Wadlow lead was reopened and the ore crushed at a 3-stamp waterpower mill on the property. Work continued here in 1900, six men being employed.

Returns were made from this district by Crooks and Townsend in 1902, by the former in 1903, and by J. C. McMahon in 1906. Some work was also done here by A. B. Stewart late in 1905, and by others in more recent years.

General Development

The extent of the workings is indicated on the plan. On none of the veins were shafts sunk to any great depth, the deepest shaft being only 96 feet, and developments do not appear to have been extensive enough to reveal the true character of the deposits.

Production

Year	Gold extracted			Ore crushed
1862	Oz.	Dwt.	Gr.	Tons
1863	75	0	0	0
1868	64	17	12	123
1869	316	6	22	519
1912 (mortared)	30	0	20	223
	1	17	0	
	488	2	6	865

LEIPSIGATE[1]

Location

Leipsigate gold district, also known as Millipsigate, is situated in Lunenburg county, 3 miles north of the Canadian National railway, and 6½ miles west of Bridgewater, a flourishing town and lumbering centre at the head of navigation on Labave river. It takes its name from Leipsigate lake, a small body of water lying about 225 feet above sea-level on the headwaters of Petite rivière.

Geology

The Goldenville formation, consisting of beds of grey and greenish grey quartzite with intercalated beds of bluish and greenish grey argillaceous slates, is here exposed in an elliptical dome, of which the main axis runs north 64 degrees (magnetic). The slates of the Halifax formation are met with about 9,900 feet north and south of the anticline. The centre of the dome occurs at the western extremity of the district, 2,000 feet west of Leipsigate lake, about area 57, block 2, and is well exposed on a rocky knoll on Caribou brook. From this point the axis runs about 400 feet north of the mouth of Caribou brook to the outlet of Leipsigate lake at its eastern end. There are numerous rock exposures and the structure of the district is, therefore, pretty definitely known. The rocks on the north limb of the fold dip north at angles increasing gradually from 30 degrees to 55 degrees, and on the south limb they dip south at angles increasing from 20 degrees to 50 degrees. The angle formed by the two limbs of the fold is, therefore, about 75 degrees and the axial plane is about vertical. The dome pitches to the east at angles increasing gradually to 30 degrees at the outlet of the lake, whereas the pitch to the west is a lower angle.

"The[2] only important fault known in the district probably follows a depression between Weagle hill and the Micmac mine and runs in a northwesterly direction towards Bird island, giving a right-hand horizontal displacement of some 400 feet to the Micmac fissure vein. There is possibly a corresponding left-hand fault following the swamp immediately east of the Crank shaft and Jackpot mines, running in a northeasterly direction towards South Duck cove and the pond above the dam; but it has not been proved."

Character of the Deposits

Gold-bearing veins have been discovered at several places around this lake over an area extending about 3 miles long and 1½ miles wide. The two classes of veins are represented, namely, the cross vein and the interbedded vein, but those of the latter class do not attain the size and richness of those usually found in the eastern part of the province. Several have been found, and mining operations have been conducted to a limited extent on a few of them.

All the auriferous veins are on the eastern end of the dome, and the interbedded leads occur along two zones, beginning at the centre of the dome on area 57, block 2, and diverging in a northeasterly and southeasterly direction on each side of the anticline.

"The[3] northeastern zone is especially well defined. It follows the northern side of the lake and extends to Ernst Washing lead, a distance of 10,000 feet from the centre of the dome. The following main leads have been opened along this zine, from west to east: the Gow lead, worked for several years by the Black Hawk Mining Company to a depth of 265 feet and for 450 feet in length, on a narrow ore-shoot, pitching west at an angle of 38 degrees, formed at the intersection of a cross-vein with the main lead; the Green lead opened to a depth of 42 feet; Deal's belt of leads, prospected; Birch Brook lead, worked 55 feet deep and 300 feet in length; Garfinkel belt of large leads, developed on the surface and on one of which a shaft was sunk to a depth of 48 feet; the Boulder Hill, McKinnon, Jim Deal, Rusty, Butterfield (32 feet deep), Fox-den, and a few other small leads have been prospected a little; the Ernst Washing lead (50 feet deep), from ½ to 1 inch thick, in a metalliferous slate belt, is auriferous, and the gold extracted by cradle washings from the drift lying immediately south of the vein is also derived, no doubt, from this vein. Much good ground is still completely undeveloped along this zone, more especially between the Black Hawk and Birch Brook leads, and beyond as far east as the Boulder hill where a great many large blocks of quartz have been observed, strewn over the surface.

---

[1] Plan published.

[2] Faribault, E. R.: Geol. Surv., Canada, vol. XVI, pt. A, p. 323.

[3] Faribault, E. R.: Geol. Surv., Canada, vol. XVI. pt. A, p. 323.

The southeastern zone of main leads is not so well defined as the foregoing, but it follows in a general way the southern side of the lake and extends probably about the same distance eastward from the centre of the dome. The principal leads opened along this zone are of the Pelton (60 feet), Stillwater, Twin, Waterman (48 feet), Aulenback (40 feet), Point (90 feet), Bluff (255 feet), Quigley (20 feet), Rose (40 feet), Johnson (10 feet), Island (20 feet), Joe Zink (10 feet), Greenwood and Lacey (20 feet deep). The rich pay-streak, worked to a depth of 255 feet on the Bluff lead, is a well-defined ore-shoot, 8 feet long measured horizontally, formed at the intersection of angling veins or 'angulars' from the northwest with a small main lead and reported to be still as good at that depth as it was above. Rich ore was mined 40 feet deep on the western end of the Rose lead, where it is cut off by a small fault on the western edge of a swamp, and gold values were developed at a few other points along its course for a length of 1,300 feet."

A great many veins have been observed cutting the strata at various angles, and these are generally composed of barren, white quartz, although a few on the north side of the lake carry sulphides and are auriferous. A great number occur at the eastern end of the district near the outlet of the lake, where they run at right angles to the anticlinal axis and have the same strike as the strata, but dip west at angles of 50 degrees to 70 degrees. They do not appear to be auriferous.

"Small angling veins or 'angulars,' branching off from or running into main leads and sometimes causing enrichments in the form of ore-shoots, have already been referred to in the case of the Bluff and Black Hawk mines. They are generally barren of gold, but they appear to be the smaller ramifications of the main channels conveying the solution into main leads where a deviation or a check to the flowage produced a concentration of minerals by precipitation."

The vein that has attracted most attention in this district and has produced the great proportion of the gold is the Leipsigate, a cross or fissure vein lying on the south limb of the dome, striking at a slight angle with the strike of the strata and dipping to the north towards the anticline and in a direction opposite to the dip of the strata. It lies 1,200 feet south of the lake, and is believed to consist of three different sections separated by faults and aggregating 9,000 feet in length. It has been opened in these three sections throughout a length of 4,350 feet.

The western section lies west of Mud lake, 3,200 feet south of the anticline, and has been opened 800 feet along its course by two shafts: the Duffy shaft, 95 feet deep, and the Dr. Cowie shaft, 25 feet deep. The vein strikes here north 83° 30′ east (magnetic) and dips north 50 degrees; the strata strike north 54 degrees east and dip south 49 degrees. The width of the vein varies from a few inches up to 2 feet and appears to be made up of small, angling veins coming from the northwest and dipping northeast at angles averaging 48 degrees. The vein has not been traced westward from the Cowie shaft, but it undoubtedly continued in that direction and may follow a swampy depression running west to the eastern end of Caribou lake.

The Gilmour shaft on the middle section is 800 feet east of the Duffy shaft, and between the two the vein is concealed by low, swampy ground and Mud lake. A small fault may lie in this area not producing much horizontal displacement, but accounting for the difference in the strike of the western and middle sections of the vein. From the Gilmour shaft the middle section has been traced 2,000 feet on a strike of north 64° 45′ east (magnetic). It dips north at an angle of 70 degrees at the surface, but only 55 degrees at a depth of 180 feet in the Gilmour shaft. The opening farthest east on the middle section is 15 feet deep and is on area 402, block 5, 100 feet east of the Bear Trap road; the vein is 6 inches thick at this point.

From this opening eastward, for 2,930 feet to the Micmac main shaft, the country is low, swampy, and flooded by several runs of Menamkeak stream. Some rich float found at the north end of Weagle hill came no doubt from this concealed portion of the vein, and it is reported that several attempts to cut the vein have proved unsuccessful, although some local miners expressed the opinion that it was probably cut some years ago on the north side of the brook, about the north end of area 44, block 4.

If the middle section of the vein maintains its course through this low ground, then there must be a right-hand fault producing a horizontal displacement of 400 feet between the middle and eastern sections. Judging from the surface features and the position of the float to the south of the vein, the fault probably runs north 30 degrees west along a depression lying east of Weagle hill and Bird island, and 250 feet west of Weagle's store. Information received since the publication of the plan points to a series of faults in this vicinity.

The eastern section of the vein has been developed for a length of 1,600 feet. The western end of this section strikes north 57 degrees east (magnetic) for the first 700 feet, and dips north at an angle of 70 degrees to 60 degrees after which it divides into two branches, the Crank shaft vein running north 53 degrees east and dipping north 70 degrees, and the Jackpot vein curving gradually northward until it runs north 21 degrees east to the edge of a swamp where it is concealed.

Regarding the character of these ore-shoots in this vein there seems to be a lack of harmony in the opinions of those who have given the question study.

Concerning the western section of the Duffy shaft Faribault says that, as the intersection of the fissure with the strata as well as with the angulars dips east, the ore-shoots may be expected to dip in the same direction. He also states that developments in the middle section at the Gilmour shaft show that the ore-shoots dip east at a low angle, occurring at the intersection of the vein with certain strata of soft rock that are more favourable to fracturing and the infiltration and deposition of gold. From the Gilmour shaft, levels have been run developing four distinct and well-defined ore-shoots reported to average 24 inches of crushing material and dipping east at an angle of 17 degrees. Regarding the eastern section of the vein on the Micmac property, he says [1]that developments to the west of the main shaft in the Micmac mine show that the pay-ore lies in shoots, lying along the intersection of the vein with certain strata, and that these shoots dip east at low angles. East of the main shaft, however, the pay-ore occurs in irregular bodies with a tendency to dip west at about 75 degrees, and possibly coincides with the branching off of the main fissure, which occurs at the eastern end of the workings. In the north branch of the fissure, shoots were reported to dip west at angles varying from 45 to 75 degrees and to go to a depth of 180 feet at the Mill-shaft and 260 feet at the Jackpot mine. These shoots are probably formed at the intersection of the main vein with angulars.

In a report on the Micmac mine dated Boston, April 3, 1901, W. O. Crosby states that the crevice in which the vein lies is not perfectly plane and that the hanging-wall has evidently slipped down at least 15 or 20 feet relatively to the foot-wall, so that the opposing walls no longer correspond. "The result is a series of lenses or wide parts of the vein alternating with narrow parts or 'pinches.' The lenses, or shoots of ore, as they may well be called, often begin and end quite abruptly and at fairly regular intervals. They are generally continuous downwards for from 10 to 20 feet, but in some cases only from 3 to 5 feet; and they all, without exception, show a general inclination or pitch to the eastward of about 1 foot in 8, due to the fact that the strike of the vein is not parallel with the strike of the strata. These shoots of ore vary in thickness, commonly from 1 to 8 feet, averaging, perhaps, 2 to 3 feet; whereas the pinches between the shoots range mostly from nothing to about a foot in thickness, averaging, perhaps, 6 inches." Calculating from the total production of ore and the number of square feet of vein worked out, he concludes that the average thickness of the worked part was not less than 18 inches.

Forbes Rickard in a report on the Micmac property says: "The vein filling is quartz with a sprinkling of arsenical pyrite (mispickel), but insufficient for mill concentration. There is a notable occurrence of secondary lime carbonate with the richer parts of the vein.

The main fissure vein of the Micmac and Leipsigate areas carries a central gouge, and in other respects bears indisputable evidence of a compound fracturing which has resulted in the formation of two sets of overlapping quartz lenses.

The first fissuring seems to have been filled with a white quartz, which in the Crank shaft and in some of the eastern workings opens out to 6 and 7 feet width of relatively poor quartz. The second movement along nearly the same fissure line seems to have resulted in a blackish quartz and altered country rock.

---

[1] Geol. Surv., Canada, vol. XVI, pt. A, p. 328.

The reopening of the fissure has been the cause of an enrichment of the original vein or quartz deposit, which enrichment takes the form of very rich but inextensive patches of gold quartz. Thus there has resulted a compound fissuring which makes a workable and payable deposit of two sets of lenses, either of which, taken separately, would have been unprofitable to extensive operations."

Rickard observed a relation between the rock structure and the direction of the ore-shoots, but claims that the ore-shoots instead of being dependent on the intersection of the vein with certain strata, are determined by the direction of the displacement in the fissure itself—a displacement that has been repeated in this instance so as to form overlapping lenses having a different trend.

History

Attention was directed to this district in the eighties, but it was not until late in the nineties that mining was carried on, on an extensive scale.

The report of the Department of Mines, N.S., for 1883, states that a considerable amount of gold had been recovered by hand from a cross vein discovered by Mr. Owen on Leipsigate lake, and that Messrs. Hall and Owen had also found a promising lode on the north side of the lake. This lode averaged 20 inches of milling ore and had been traced a distance of 600 feet. In 1884 a 10-stamp mill had been built and Messrs. Hall and Owen returned a yield of 410 ounces from 130 tons crushed.

For a number of years after this there seems to have been little mining. Some Germans of Minneapolis organized a company known as the Duluth Gold Mining Company to work a vein south of the lake, the middle section of the Leipsigate vein; and in 1886 a Wiswell mill was erected, but the company apparently met with no success. From 1888 to 1892, inclusive, small returns were made by the Millipsigate Gold Mining Company, and in 1896 by Cashon and Hines.

The latter company carried on operations and made fair returns for 4 or 5 years from the mine now known as the Micmac. In 1898 the Cashon-Hines mine was worked under the management of Capt. John Hines, who had thirty men employed on the vein south of the lake. At the time of the inspector's visit, there were three shafts on this property; the mill shaft 172 feet deep, and two shafts about 700 feet southwest of the mill shaft 100 feet and 200 feet deep. Drifting and stoping were being carried on. The Owen Gold Mining Company worked steadily during the year at the Jackpot, north of the Cashon-Hines mine, on what was thought to be a continuation of the same lead, which was believed to curve northward, and the ore was crushed at a 5-stamp mill.

In 1889, mining was vigorously conducted at the Cashon-Hines mine under the management of Capt. Hines, and the ore was crushed at a 10-stamp mill. Work was also continued at the Owen mine under the management of John Lacey, although the mine was closed for a time on account of the difficulty of coping with the water. Some prospecting was done during the year by David McKay north of the Owen mine. Both the Owen and the Cashon-Hines mines made returns in 1900.

The Cashon-Hines property was then acquired by the Micmac Gold Mining Company. This company commenced work on April 15, 1900, under the management of T. W. Moore, and returns were made every year until 1908, the largest being in 1905, when a yield of 2,239 ounces of gold and 402 ounces of silver was obtained from 5,503 tons of ore. From 1901 to 1908 inclusive, this company reported about 9,650 ounces of gold from 30,000 tons of ore. Mining was actively carried on, and in 1903 the main shaft was 370 feet deep. This year a new shaft house was built and a new boiler and an air compressor put in. A cyanide plant consisting of four treatment vats for tailings was set in operation in February, and the treatment was carried on with apparent success under the management of H. S. Badger. The capacity of the plant was 50 tons per day and stock was taken from the old tailings beds as well as from the plates.

In 1904 the cyanide plant was still running and the old tailings beds were nearly exhausted. Forty-five men were employed by the company and stoping was actively conducted. Preparations were also made for adding 5 stamps to the mill, thus making it a 15-stamp mill. In 1905, the shaft bottom was 545 feet deep and levels, No. 5 and No. 6, were driven at a depth of 443 feet and 540 feet respectively. The next year sixty men were employed, but only half as much ore was taken out as in 1905

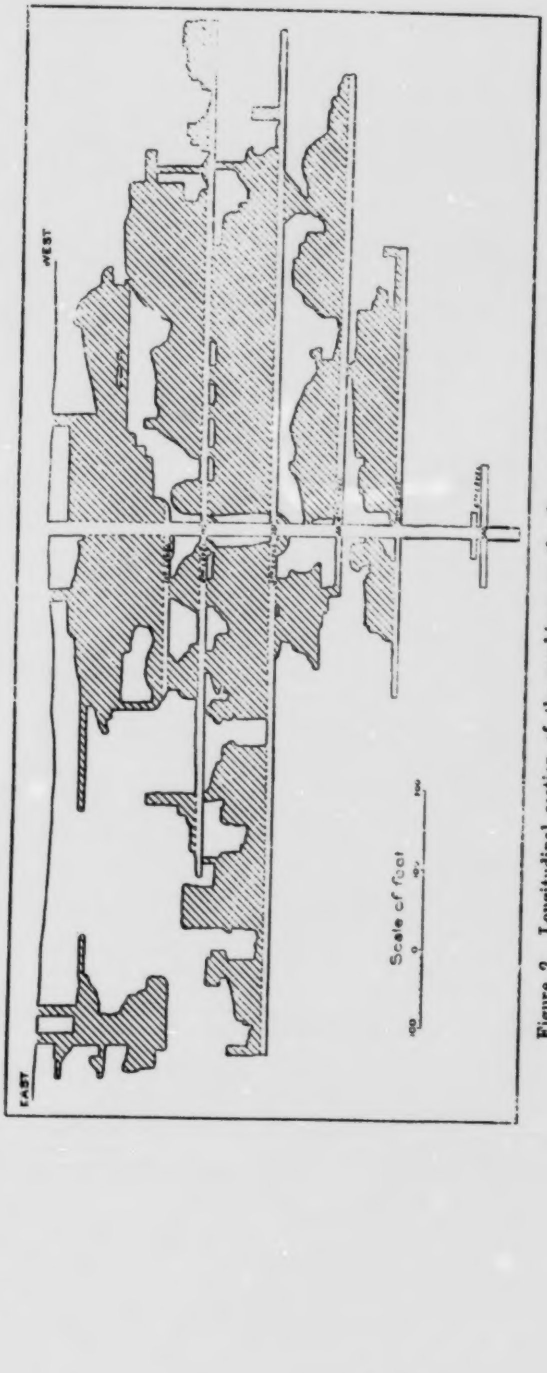
EAST
WEST
Scale of feet
100
0
100
200

Figure 2. Longitudinal section of the workings on the fissure vein at the Micmac mine, Leipsigate.

and the yield was very much reduced, 890 ounces of gold and 169 ounces of silver being extracted from 2,543 tons of ore. The high cost of fuel was a serious problem and efforts were made, in 1906 and 1907, to make arrangements with the town of Liverpool whereby cheap electric power might be procured, but an agreement could not be arrived at regarding terms, and negotiations were broken off. During the early part of 1907 the shaft was deepened to 596 feet; later on mining was discontinued for a time, while the company investigated the waterpower possibilities of the vicinity. The mine was kept unwatered, however, to the 300-foot level, and work was resumed in December and continued until May, 1908, under the management of T. W. Moore. During this period 868 ounces of gold and 194 ounces of silver were extracted from 2,692 tons of ore. The ore was taken from the continuation of the old stopes, and no mining was done below the 300-foot level. In July some crosscutting was done, but apart from that no other work was done after May 1, and in December the mine was closed.

Several other companies have carried on operations in this district. In 1901 the Scotia Mining and Development Company acquired the old German property, and under the management of C. N. Crowe extensive development work was done. This property is about a mile west of the Micmac mine and is thought to be on the same vein. The old German shaft was opened, but allowed to fill in January; it was pumped out again in May, but finally closed in July. Work was commenced on the Gilmour shaft, 780 feet west of the German shaft, on February 1, 1902, by the Home Gold and Copper Company under the management of C. N. Crowe. Some ore was taken out and tested at the Owen 5-stamp mill.

In 1903, a small yield was reported by Wade and Patton, but since then the only returns made from this district were from the Micmac mill. In 1905, P. H. Moore did some underground work at the Owen mine, but it was allowed to fill the following year. Other work has been done in this district but little record seems to have been kept of it. Veins in the northern part of the district have been opened at various times, and the most extensive operations seem to have been conducted by the Black Hawk Mining Company. Considerable work was done on the Gow lead and a 10-stamp mill was operated.

General Development

The following tabulated statement shows the extent to which operations were conducted by the Micmac Gold Mining Company on the Leipsigate vein.[1]

Levels	Depth from surface	Northeast from shaft		Southwest from shaft	
		1906	1907	1906	1907
	Feet	Feet	Feet	Feet	Feet
No 1	154	195	195		
" 2	198	360	360	640	640
" 3	285	664	664	634	634
" 4	368	84	84	559	574
" 5	443	118	210	275	356
" 6	540	30	Abandoned	25	Abandoned
" 6	555	0	67	0	96
Shaft	596	Sinking 51	feet during	1907	

No. 6 level was abandoned on account of bad rock encountered in the hanging-wall and a level was started 15 feet below this.

In 1908, mining operations were not carried on below the 300-foot level. In July, a crosscut from the 200-foot level, 380 feet east of the shaft, was driven south 119 feet, cutting a main lead at a distance of 99 feet, and a raise was started on this new lead.

On the north branch of the vein at the east two shafts were sunk 180 feet and 300 feet deep; on the south branch the Crank shaft was sunk 50 feet.

On the middle section of the Leipsigate vein the property at the west end is known as the Gilmore property. Here a shaft was sunk 180 feet and at a depth of

---

[1] Rept. Dept. Mines, N.S., 1907, p. 103.

100 feet a level was driven east 300 feet and west 50 feet. Adjoining this property to the east is the old German property on which two shafts were sunk about 130 feet deep and 200 feet apart. A level driven at a depth of 110 feet connects the shaft and extends beyond each, having a total length of 500 feet.

The extent of the development in other parts of the district is given in the chapter dealing with the character of the deposits and is indicated on the published plan.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1897	82	7	0	167		7	8
1898	1,639	1	0	3,421		9	12
1899	1,161	8	0	3,541		6	13
1901	423	12	5	819		10	8
1902	1,135	2	14	2,390		9	7
1903	2,009	18	9	7,861		5	3
1904	1,680	14	0	6,394		5	6
1905	2,239	8	0	5,503		8	3
1906	890	17	0	2,543		7	0
1907	805	15	23	2,584		6	6
1908	868	5	19	2,692		6	11
	12,936	9	22	37,915			

Mint returns show that the gold obtained contained silver as follows:

	Oz.	Dwt.	Gr.
1903	281	12	19
1904	262	16	0
1905	402	9	0
1906	168	19	0

LOCHABER

Lochaber is situated in the eastern part of Halifax county, 5 miles from Lochaber post office and 11 miles north of East River Sheet Harbour, from which it can be reached by a good wagon road. The leads in this locality occur in a syncline near the top of the Goldenville formation. The strata dip south 60 degrees to 78 degrees and north 55 degrees. Work in this place has been of an exploratory nature only. Most of the work was done on a vein with a dip north of 55 degrees at the surface. The dip decreases to 48 degrees with depth and the vein pinches out at the syncline. A shaft was sunk 62 feet on this. In 1887, J. H. Anderson opened several leads on the property of the Lochaber Company, and in 1888, Mr. Ashton made preparations for opening the main lead and built a road to the mine from the end of the East River of Sheet Harbour road. The next year the Lochaber Gold Mining Company had a mill running, but little has been done here since except some desultory prospecting.

MALAGA[1]

Location

Malaga gold district, also known as Molega, is situated on the eastern end of Queens county, between Malaga and Ponhook lakes. It lies 5 miles south of South Brookfield, a station on the Canadian National railway.

---

[1] Plan published.

Geology

The Goldenville formation is exposed in an anticline with its axis following the southern part of the range of areas 551 to 600, block 5, and plunging to the east and west at low angles, the centre of the dome lying about area 537 on the east shore of Ponhook lake. On the north limb of this fold the strata dip north at angles increasing from 70 degrees near the apex to 80 degrees at a distance of 2,500 feet to the north, whereas on the south limb the dip increases from 45 degrees to 55 degrees. Three hills of drift running north and south have hindered surface exploration, but the veins no doubt continue beneath these.

Developments up to the present have revealed few faults. There are a few small faults on the Parker-Douglas property, but the most important one lies on the property of the Malaga Mining Company and runs northwest from the Nine-Boulder workings.

On the Parker-Douglas property a fissure 12 feet wide, and filled with uncemented fragments of country rock runs at right angles to the strike of the strata.

Character of the Deposits

The veins are of the interbedded class and lie in slate beds between strata of quartzite. Although a few veins have been opened on the south limb of the anticline, all the mining operations have been conducted on the north limb. The veins are in disconnected groups, and in their distribution do not seem to be so dependent on the main anticlinal structure as in other districts. Other unknown influences have been in operation and it is difficult to discern any general law in the distribution of veins or cross-shoots. Each group has its peculiarities with regard to ore distribution.

On the Malaga Mining Company's property the group of leads comprising the North, Chester Mill, and Crows Nest, worked respectively to depths of 100, 210, and 80 feet, has ore-shoots dipping east at low angles. These ore-shoots are formed by angulars from the foot-wall and are not well defined.

On the same property the three Rabbit leads have ore-shoots dipping west. That on the Middle Rabbit is especially well defined, dips west 30 degrees to 37 degrees and has been worked to a vertical depth of 292 feet; whereas that on the South Rabbit is not so regular and is formed by angulars from the south. This group of veins extends eastward past the hill of drift on to the property of the Boston Gold Mining Company. Here the Middle Rabbit was worked to a depth of 325 feet on an ore-shoot dipping east at an angle of 30 degrees. The shoot was made by angulars from the foot-wall and was limited in depth by a big bull vein from the foot-wall. It was in this bull vein that a little scheelite was found.

The Nine-Boulder lead, 500 feet south of the Rabbit leads on the Malaga Mining Company's property, had an ore-shoot dipping west and worked to a depth of 110 feet, where it was cut off by a fault and could not be recovered. Much prospecting to the west, where there was rich drift, proved unsuccessful.

On the Parker-Douglas property and the northern part of the Boston Gold Mining Company's property a group of veins extends from 2,000 to 3,000 feet north of the anticline, and in the space of 1,000 feet 35 veins have been cut. Ten of these have been worked to a depth of over 100 feet, the McClair being worked 150 feet, the Twin 160 feet, and the Big Ballou 260 feet. In several of these veins well-defined ore-shoots dip west at low angles. These veins are concealed at the east and southwest by hills of drift and the presence of a swamp has prevented the exploration of some very promising ground right in the middle of the group. It is possible that a zone of veins extends from this group southwest beneath the hill of drift to the Rabbit leads.

On the Caledonia Mining Company's property two veins, thought to be the continuation of some on the Parker-Douglas property, have been worked, the Caledonia, possibly a continuation of the Twin, to a depth of 175 feet, and the Mill, lying 215 feet to the north, to a depth of 110 feet.

On the Minneapolis and Molega Company's property on the eastern plunge of the anticline work has not been very extensive, the 100-foot shaft on the Twin lead being the deepest. The ore-shoots appear to dip east with the plunge of the anticline. Some rich drift has been found on the Nelson and Fiske areas, but no veins of importance.

History

This is one of the more recently developed districts and for a few years it took a prominent position among the producers of the province. The average yield has been high, but it is believed that the statistics do not represent the actual production; for, as much of the gold was coarse, it is thought that a great deal found its way into the pockets of dishonest workmen and that quite a little even from the plates did not reach the owners. The district, however, saw a great deal of bad management, men with little or no mining experience were placed in charge of important works, business was conducted in an extravagant and unscrupulous manner, speculation was rampant, properties became involved in litigation, and as a consequence the district received a setback from which it never recovered.

Gold was discovered here in June, 1886, and the announcement of the discovery was followed by a rush of prospectors into the district, several auriferous veins were exposed, and before the end of the year mining operations were conducted on the properties of Wharton and Company, and McGuire and Smith. Prospecting and exploratory work continued during 1887, the settlement grew rapidly, and in 1888, a large number of buildings of all kinds had been erected and the population had increased to about 400 people. This year the Malaga Mining Company, Limited, erected a 20-stamp mill on the shore of Ponhook lake and carried on active mining, under the superintendence of John McGuire, sending in very satisfactory returns. The Parker-Douglas Company, which had been organised in 1886, reopened its mines in the northern part of the district and put in a stamp mill and an air compressor. The Minneapolis and Molega Mining Company did a large amount of development work at the east end of the district and built a 20-stamp mill, but on account of the unsatisfactory nature of the yield operations were not long continued.

In 1889, the district was spoken of as the most important in the province and nearly 4,000 ounces of gold was returned by the Parker-Douglas Company and the Malaga Mining Company, the latter producing over three-fourths of the total. This year there were four crushers in the district with a total of 65 stamps, all of which, however, were not in operation. The Minneapolis crusher was not running; the Malaga Mining Company carried on active mining; the Parker-Douglas Company increased the capacity of their mill and pushed operations; the Caledonia Company erected a very complete mill and did a large amount of development work in opening up several veins in the northeastern part of the district; and the Boston Gold Mining Company, incorporated this year, acquired areas east of the property of the Malaga Mining Company and opened up several important veins under the management of F. K. Ballou.

In 1890, the mill of the Boston Gold Mining Company was completed and put in operation. On the Malaga Mining Company's property operations were carried on under the management of G. A. Wade, and the North and Rabbit leads were worked, while repairs were being made in the Chester Mill, Nugget, and Boulder leads. At the Caledonia mine—Chas. McLeod, manager—thirty-six men were employed, prospecting by means of a diamond drill was carried on, and nearly 350 tons of ore crushed at the 10-stamp mill. Roderick McLeod, as manager, had forty men employed on the Parker-Douglas property, development work was carried on, and over 4,000 tons of quartz was crushed in the 20-stamp mill. All four companies made returns this year, but over half of the gold was produced by the Malaga Mining Company.

In 1891, returns were made by the Parker-Douglas Company, the Malaga Mining Company, and the Boston Gold Mining Company. Over 4,800 ounces of gold was reported and nearly half of this was produced by the Boston Gold Mining Company, under the management of F. K. Ballou. The Caledonia mine was idle, the mill having been destroyed by fire, and during the year the Parker-Douglas mine was also closed. G. A. Wade was still conducting operations at the Malaga mine and Charles McLeod had eight men employed on the Nine-Boulder lead.

The Boston Gold Mining Company and the Malaga Mining Company made good returns in 1892; the latter company having reported in round numbers 9,900 ounces of gold from 7,500 tons of ore from 1888 to 1892 inclusive. At the time of the inspector's visit in 1893, the Boston Gold Mining Company was the only one working, and F. K. Ballou had twenty-five men employed. In addition to this a little prospecting was done on the Parker-Douglas property.

During 1894-6, inclusive, the most important returns were those made by the McKay mill. In 1895, some little work was done on the property of the Malaga Mining Company, and the Boston Gold Mining Company, under the management of Mr. Turnbull, did considerable development work. The Old Minneapolis mine was pumped out and extended, under the management of Mr. Dixon, and, although it was stated that the quantity of ore and its appearance justified the expectation of a resumption of operations, little results seem to have followed, as the mine is not mentioned in the report for 1896.

During 1896 D. S. Turnbull and Mr. Doull did some work on the Twin lead on the Parker-Douglas property, and A. J. Cox had twelve men employed on the McClair lead for the Old Provincial Mining Company. The year 1897 saw R. R. McLeod working with twenty-nine men on a new lead called the McLeod lead on the Parker-Douglas property. Good returns were made this and the following year by Mr. McLeod. In 1897, Logan Ball had sixteen men employed on the Twin lead and Sydney Aldred had seven men working on a 2½-inch lead north of the Twin lead. All this work was under the superintendence of R. R. McLeod. Subsequently to 1898 about the only returns made were those made by tributers, and no returns were made between 1902 and 1908. In 1904 the properties of the Parker-Douglas Company, the Boston Gold Mining Company, and the Caledonia Mining Company were amalgamated under the title the Markland Mining Company, capitalized at $1,000,000, and shares were offered to the public.

In 1908 work was resumed under the management of W. J. Prisk and in July the west shaft on the centre or main Rabbit lead was reopened. This is one that had been sunk many years previously by John McGuire. Several prospect pits were sunk also on the Hard lead.

During 1909 twenty-eight men were employed by the Ponhook Mining Company, W. J. Prisk, manager. The shaft on the Rabbit lead was continued to a depth of 292 feet. At a depth of 274 feet the vein was lost by a fault "pitching south 36 degrees and west 24 degrees." Levels were driven at a depth of 242 feet and a crosscut driven south 56 feet cutting the South Rabbit lead 18 feet south of the main Rabbit lead and the Slate lead 50 feet south of the main Rabbit lead. Some drifting has been done on all, and stoping on the 110-foot level east of the shaft, and on the 242-foot level west of the shaft as well as a small amount on the Slate lead. Crushing was done in the old Malaga Mining Company's mill.

In 1910 a fault having a throw of 18 feet to the south was encountered in a level driven east on the South Rabbit lead at a distance of 100 feet from the crosscut. The level was continued 194 feet east and faults were struck at 125 feet and 133 feet, having throws to the south of 5 feet and 18 inches, respectively. The faults admit a considerable volume of water. The crosscut to the south was extended 260 feet and cut the State, Blue, and New Year leads. A yield of 326 ounces of gold was obtained from 776 tons of ore. In 1915, 102 tons of ore from the Ponhook mine gave a yield of 117 ounces. In 1917, shafts were unwatered by the Porcupine North Star Gold Mines, Limited, and in 1918, 40 tons of ore was crushed, yielding 38 ounces of gold.

In 1911, A. R. Peacock sank a shaft 115 feet deep on the Nelson lead. On area 525 a vertical shaft was sunk 115 feet deep on the axis of the anticline and at a depth of 100 feet a crosscut driven north 40 feet and south 113 feet cut several veins. A yield of 69 ounces was obtained from 233 tons.

S. A. Hiseler did some prospecting during the years 1921 to 1925 on the Parker-Douglas property and small tonnages of ore were crushed.

The Malaga Gold Mines carried on prospecting in 1922 and 1923, and in 1924 crushed 46 tons of ore from which 143 ounces of gold was obtained. The work was confined mainly to the Bryden lead, a 6-inch lead found between the shaft house of Mill lead and Ponhook lake. Operations were continued in 1925 on this lead, the shaft was carried to a depth of 85 feet and 257 ounces of gold obtained from 122 tons of ore. In 1926 a yield of 59 ounces was obtained from 90 tons. In 1927 the shaft on the Chester Mill lead, area 846, was deepened by the Malaga Mining Company, some drifting was done on the 120-foot level, and 23 ounces of gold was recovered from 96 tons of ore. Operations were discontinued, but were renewed in 1928.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1889	3,976	3	13	4,388		18	2
1890	3,883	12	12	6,633		11	19
1891	4,664	13	17	4,826		19	12
1892	2,656	5	14	2,720		19	12
1894	1,060	11	0	1,688		12	13
1898	2,040	0	0	1,200	1	14	0
1901	228	17	0	173	1	6	5
1909	615	14	5	1,021		12	1
1910	326	12	6	776		8	10
1911	69	14	12	233		5	23
1915	116	16	0	102	1	2	22
1918	38	0	0	40		19	0
1922	92	16	0	41	2	5	6
1923	136	11	0	45	3	0	16
1924	180	18	3	63	2	17	10
1925	283	12	0	154	1	16	19
1926	59	9	0	90		13	5
1927	34	0	17	115½		5	21
	20,462	7	3	24,308½			

MCKAY SETTLEMENT

This gold district, also spoken of as Ashdale, and Meander River and Upper Newport, is situated in Hants county 1 mile southwest of Upper Newport and about 5 miles by road east from Brooklyn station on the Midland division of the Dominion Atlantic railway.

The[1] Gold-bearing series here forms an anticline, the axis of which runs north 60 degrees east (magnetic) and plunges to the northeast. The fold is flat, the strata immediately north of the axis dipping at an angle of 15 degrees and those at the south dipping at angles increasing from 10 degrees to 35 degrees. At the west of McKay settlement the Goldenville formation is exposed, and the Halifax formation extends eastward. The latter formation, in which the auriferous veins are found, consists of bluish black, pyritous slate with occasional beds of black, fine-grained quartzite. To the north of this anticline and within half a mile of it the Gold-bearing series is overlain by Carboniferous limestones.

The rocks are well exposed in the streams crossing this anticline, and along Little Meander river several interbedded quartz veins have been prospected. The veins show rolls and carry sulphides. There are some belts of slate with numerous small veins that might furnish large bodies of low-grade ore. The most of these veins are found below the iron bridge over the Little Meander. Half a mile south of the main road is a cross vein, 4 inches wide, carrying much mispickel. It strikes 180 degrees (magnetic), dips east 85 degrees, and had a 50-foot shaft sunk on it by John Withrow.

A discovery[2] was reported in 1868, but work has been little other than of an exploratory nature. In the flat intervale beginning 1,500 feet below the iron bridge, the alluvium has been washed for gold; so also has that on Meander river below its junction with the Little Meander.

---

[1] Geol. Surv., Canada, Ann. Rept., vol. XII, pt. A, p. 181.

[2] Rept. of Chief Commissioner of Mines, Nova Scotia, 1868, p. 3.

MILLER LAKE

Miller Lake gold district lies in the western part of Guysborough county, 5 miles by rough road from Ecum Secum Bridge, which has a daily stage and mail from Sherbrooke.

The Goldenville formation is exposed here on an anticline that was indicated on the map of this part of the province before gold was discovered at this point. On the north limb the strata dip north at an angle increasing rapidly to 45 degrees and 58 degrees, and on the south limb the dip is to the south at angles varying from 50 degrees to 75 degrees. The fold plunges to the east and west forming a dome.

The veins follow the stratification planes and lie close to the anticlinal axis on each limb. In[1] 1903 a great number of veins had been exposed and some had been prospected for short distances by open-cuts or shallow pits. They were found to vary from a few inches up to 12 inches in thickness and a few auriferous rolls were found attaining a thickness of 18 inches and dipping east with the plunge of the anticline. Of the veins then discovered, the Noughler and Lonecloud leads on the north limb and Mill lead on the south limb were the most important, and a little sinking had been done on these.

According to a prospectus issued by the Miller Lake Gold Mining Company, Limited, in 1905, a shaft had been sunk 105 feet cutting a number of auriferous veins and a crosscut had been driven 240 feet cutting the veins at right angles. In this crosscut many auriferous veins were cut varying in thickness up to 12 inches. The north lode on this property, that is the Lonecloud lode, had been traced 3,600 feet and was found to be auriferous for that length. As an inducement for the investment of capital in this district the company calls attention to Liscomb falls a few miles away, from which can be developed, it is claimed, 2,000 horsepower.

Rich float has been found at different points along the anticline. So far as revealed by present development the zone of enrichment appears to run parallel with and close to the anticline.

In 1902, the Liscomb Falls Gold Mining Company did some work on the Mill lead and erected a 5-stamp mill, formerly owned by Robt. Brownell. Some prospecting was done in 1903 by E. H. Oland, Capt. Smith, and Chas. Allen, and in 1905 and 1906 work was carried on by the Miller Lake Gold Mining Company, Limited, and crushing was done at a 10-stamp mill built in 1905.

In 1913 Dr. C. C. Ellis tested the Lonecloud, Little North, Twin, and Little Rusty leads, and in 1915 T. W. Fancy obtained 9 ounces of gold from 18 tons of ore. The Evangeline Gold Mines, Limited, unwatered the old shaft on the Lonecloud lead in 1927 and made preparations for mining. Later a new shaft was started on this lead and in January, 1928, it was 30 feet deep.

MILL VILLAGE

Mill Village district lies in the southeastern part of Queens county, a mile west of Port Medway river, and 3 miles north of Medway station, on the Canadian National railway.

The rocks consist of whin and interstratified beds of slate belonging to the Goldenville formation, and dip south. The great thickness of the drift makes prospecting difficult, but [2]a number of interbedded veins have been exposed, and a few belts of closely interstratified slate and quartz. The main lead of the Gold Eagle Mining Company is an 8-inch vein in the middle of a 3½-foot slate bed with quartzite walls; this strikes 240 degrees (magnetic) and dips south 57 degrees. Some distance north of this an 8-inch vein is a 4-foot belt of slate with whin walls has been worked.

The discovery of rich drift encouraged prospecting in this district during the eighties and nineties. Prospecting was very expensive on account of the thickness of the drift. Among those to engage in exploratory work were B. H. Porter and G. W. Goddard, who ran 300 feet of trenches and tunnels about 1886; in the years 1889-90, Capt. Cashon and W. H. Prest searched for the 16-inch lead from which auriferous quartz boulders had been discovered; about 1891, Chas. and Wm. Hall made a strong effort to find it, but became discouraged by the 30 feet of drift and trouble with water; and in 1896 Joseph Zink also prospected here. The district remained quiet until

---

[1] Faribault, E. R.: Geol. Surv., Canada, vol. XV, pt. AA, p. 180.
[2] Rept. of the Dept. of Mines, Nova Scotia, 1899.

1898, when Jason Munroe discovered the vein, afterwards mined by the Gold Eagle Mining Company. In 1899 other veins were cut, and this year American capital became interested and the Gold Eagle Mining Company was chartered and capitalised at a very high figure. In 1900[1] this company erected a 10-stamp mill and carried on systematic development. In 1901 the returns for this district were 742 ounces from 1,057 tons. The main shaft is 190 feet deep. At a depth of 112 feet levels were driven east 160 feet and west 300 feet, crosscuts were run 60 feet north and 60 feet south, and diamond drilling was carried 40 feet farther north at the end of the north crosscut. The only new lead was a ½-inch one in the north crosscut, although on the surface a 4-inch lead was exposed 65 feet north of the main lead and another 5-inch lead 95 feet north. On the 8-inch vein farther north a shaft was sunk 60 feet and 10 tons of quartz was crushed.

In 1917 and 1918 D. M. Thompson carried on surface prospecting and sank a number of test pits. In the west end of the district he discovered a lead 1,700 feet west of the main shaft on the Gold Eagle vein. He traced the Twin lead 2,000 feet southwest of the old 60-foot shaft on this lead and opened a new lead, called the Thompson lead, in the west end of the district 100 feet northwest of the Twin lead. The Thompson lead consists of 8 inches of quartz with stringers, making one foot of crushing ore, and the Twin lead consists of 7 inches of quartz, 18 inches of quartzite, 6 inches of slate, and 10 inches of quartz. A small amount of work was done in 1918 and 1919.

MONTAGUE[2]

Location

Montague gold district lies in Halifax county about 5 miles northeast of Dartmouth across the harbour from Halifax, from which it is accessible by wagon road.

Geology

The Goldenville formation[3] here forms a long and narrow elliptical dome with an axis running north 78 degrees east. The plunge to the east is 5 degrees on areas 834 and 835 and 8 degrees on area 781 farther east, and the plunge to the west is about 5 degrees on the north part of area 951, 15 degrees on area 931, and 21 degrees on area 926. The strata dip at a low angle to the north and south near the anticlinal axis, but the dip gradually increases until it is vertical 1,000 feet south of the axis, and 70 degrees at a distance of 1,250 feet north of it. The axial plane, therefore, dips north about 80 degrees.

Faults are neither numerous nor large. One radiates southward from near the centre of the dome and gives a horizontal displacement of 40 feet at the Lawson lead, whereas a few other parallel faults met with in the workings of the Skerry, Rose, and other leads have a strike almost parallel with that of the strata and dip south at a low angle. These latter are of the nature of thrusts.

Character of the Deposits

The veins follow the stratification planes and those that have proved remunerative lie in a zone about 600 feet wide, the northern limit of which is about 500 feet south of the anticlinal axis on that part of the south limb where the dip varies from 80 degrees to 90 degrees. Among the most important of these may be mentioned the Belt, De Wolfe or Annand, Twin, Rose, and Skerry leads. In many of the leads pay-shoots dip to the west at a low angle, whereas in others, and especially in those in the southwestern part of the district, the pay-shoots occur at the intersection of angulars with the main leads.

A few veins have been prospected on the western continuation of the anticline where it crosses the road to Waverley and on the eastern extension on the east side of lake Major.

Rich drift has been found on the Preston road, 2 miles south of the district, and much time has been spent in trying to find its source.

History

The discovery in the early sixties, of a boulder weighing less than 100 pounds and yielding in the mortar gold to the value of $1,600, led to careful prospecting in this district. Numerous other rich boulders were found and the lead known as[1] the Lawson lead was finally discovered by Messrs. A. McQuarrie, A. Robinson, J. O'Connor, and B. Clarke. The district was proclaimed such in the early part of 1863 and mining operations commenced, but were not carried on with that vigour that the high average yield of the quartz would seem to justify. The production for 1864 and 1865 was higher, but it declined again in 1866.

---

[1] Rept. of the Department of Mines, 1900.

[2] Plan published.

[3] Faribault, E. R.: Geol. Surv., Canada, vol. XI, pt. A, p. 152.

In 1865 a crusher was erected, all the ore up to this year having been milled at Waverley. Only two mines were worked in 1866; these were on the one lode, the Belt, and were operated by the Albion and Union companies. Both companies mined by open-cut, the former making a cut of 500 feet long with an average depth of 80 feet, and the latter, 381 feet long with an average depth of 45 feet. The Union Company was the only one working in 1867, and shafts were sunk on the old lode and a part of the ground stoped out. This company also opened the South or Werner lode during this year, but it received little attention the next year.

In 1868 the only operations of any importance were those carried on by the Montague Company on the lode worked by the underhand stoping throughout a length of 366 feet, and eight different shafts were used. This lode, the Belt lode, had been worked continuously since its discovery in 1863 and operations were continued in 1869 by R. G. Leckie and Company, at the Montague mine, once known as the Union mine. In the early part of the year the Belt and Werner or St. Patrick leads were worked, but operations were later suspended on these because of insufficient machinery and work was directed to two newly discovered lodes, the Lydia and the Sarah, probably those indicated on the plan as the Lydiard and York. The former was opened a length of 320 feet and the latter 140 feet. Both these lodes were cut by cross leads some of which proved quite rich. This company found their light 8-stamp mill unequal to the task of crushing their ore and by the close of the year had a 15-stamp mill nearly completed.

Some prospecting was done in 1869 by Messrs. Temple and Salter and an association of Welsh miners opened the Bendigo mine, but later ceased work and sold out.

One of the most important events of the year was the reopening of the works on the Belt lode at the old Albion mine, formerly called the McQuarrie mine. This was reopened by Messrs. W. and E. Lawson, who carried on continuous active operations until some time in 1874 and took out 10,000 ounces of gold, the yield in 1871 being as high as 2,272 ounces from 468 tons, and in 1870, 2,582 ounces from 447 tons and 7,792 days' labour. In 1873 an efficient 10-stamp mill was erected and the main shaft carried to a depth of 300 feet. Work was carried on at this mine in a most systematic manner and a plan of the workings was kept, on which was recorded the yield of the quartz in the different parts of the mine. The rich portion of the lead dipped westward, and the quartz in the eastern part of the mine diminished in thickness and value with depth. The western slopes also became impoverished with depth and the yield became so small as to make it no longer profitable to keep the mine opened. The Messrs. Lawson ceased work in 1874, and the mine was let to tributers, who, however, reported very little gold, the returns being as low as 50 ounces in 1877.

The Montague mine was transferred from Messrs. Leckie and Company to Messrs. Taylor and Weir, the new mill was started in June, 1870, and active mining was carried on during the year. The principal work was done on the following three leads: the Belt lode, where the main shaft was carried to a depth of 160 feet and the east and west shafts 150 feet; on the St. Patrick, which was mined to a depth of 70 feet; and on a rich cross lead, which was worked from a shaft on the Sarah lode. In 1871 this company reported 724 ounces from 309 tons, the most of which was taken from the St. Patrick lode, operations on the Belt lode having been entirely suspended. The next year the company ceased work and the St. Patrick lead was worked a little by tributers, who were forced to quit through the crushing of their hanging-wall.

In 1871, a mine was opened by Messrs. Brown and Barker on tribute on the property of the Montreal Exploration Company. In 1872 DeWolfe and Company sank three shafts on the Fissure or North lead, opened the South lead by two shafts, and erected an 8-stamp mill. These two leads are marked on the plan DeWolfe and

---

[1] Industrial Advocate, March, 1897, p. 2.

Twin respectively. In 1874 this property was mined by tributers on area 1166, known as Bendigo. Symond's property was also let to tributers, who worked the cross lead on area 1461. Work at Bendigo and on the cross lead on area 1461 continued during 1875. In 1876 work on area 1461 ceased, but was resumed later in the year by another set of tributers. Some gold was obtained by tributers on the outcrop of the Belt lode on the Lawson property. The next year some prospecting was done and some tributing on the Belt lead on the Lawson property, on the St. Patrick lead, and on the cross lead, and the adjoining Sarah lead. Little gold was obtained, however, and very little in 1879, during which year some mining was done at Bendigo on the DeWolfe lead.

After several years of comparative stagnation this district took on new life in 1879. This was due to the discovery of a rich lead called the Rose lead from the colour of the quartz boulders derived from it. These rich boulders had been known for some time and frequent efforts were made to discover their source. Finally Geo. W. Stuart became interested in the search, and after a careful inspection of the direction of glaciation and systematic work he succeeded in exposing the Rose lead on December 7, 1878. The property was sold to some Americans and active operations were carried on with large yields until the autumn of 1880, when a flat fault was met that passed so much water as to flood the mine. New pumping machinery was procured and the mine pumped out early in 1881. Operations were started on what was said to be the eastward extension late in 1880 and carried on in 1881. This, however, seems not to have yielded profits, for the Rose Gold Mining Company ceased working in 1882.

The discovery of the Rose lead stimulated operations in other parts of the district. On the Symond's property a lead, probably the Sherry, was opened to the west of the mill, work continued during 1880, and another opening was made about 2,000 feet west of the mill where the lode proved rich. Work ceased for a while in 1881 during the repairing of the mill, but was again resumed and continued during 1882, when the property was known as the Symonds and Kaye property. Messrs. Symonds did a little work here in 1883, and others prospected the eastern part of the property.

In 1879, a few lots of quartz were taken from the Temple property, and in 1880 it was prospected by Mr. Stuart, who sank a shaft on the eastern extension of the Rose lead. Mr. Sutherland did some work in 1879, and in 1880 he worked some areas lying immediately west of the Temple area, besides opening several promising lodes on area 1355 and on an area adjoining the free claim. In 1881, Mr. Sutherland continued working his properties and prospecting was carried on by Messrs. McDonald, Stutter, and Foster. During the autumn a concentrating plant was erected a few yards east of the Symonds property by T. B. Hale. A dry process of concentrating was to be applied to the tailings of the district. The plant was destroyed by fire in 1882, but rebuilt the following year, and work was carried on a short time during the summer of 1884.

In the autumn of 1883 the Bluenose Gold Mining Company started work on the DeWolfe areas and the next year the DeWolfe lead was worked and three shafts were sunk on the Twin lead about 60 feet to the south containing two veins 10 inches and 5 inches thick respectively. Work was continued on the DeWolfe and Twin leads by the New Albion Gold Mining Company in 1885 and stopes were carried along the former lead for a distance of 700 feet and along the latter, 500 feet. A pay-streak was struck yielding 1,369 ounces from 337 tons. Although 4,001 ounces were extracted this year from 2,800 tons, work at this mine ceased the following spring.

In 1884, Mr. Gladwin did some work on the British American areas, adjoining the DeWolfe property on the east, and in 1885 Mr. Oakes and others did some prospecting to the south. In 1886, Mr. Hale reopened the main lead on the Symonds property, but work was not continued long. For several years little was done in this district except a small amount of tributing, although W. S. Skerry and Company reported 498 ounces in 1888 from the Skerry lode on the Symonds and Kaye property.

The year 1889, however, saw a marked revival in the mining industry of the district. Charles Annand, into whose hands the New Albion or DeWolfe property had passed, reopened the mines and carried on vigorous operations. The Rose mine was reopened and some very rich ore found; the Montreal property received some attention from tributers and good returns were made by tributers on the Symonds-Kaye areas. Returns were made from the Annand, Rose, and Symonds-Kaye properties in 1890 and the production of the first for this year was nearly double that of the preceding year. In 1891 returns were made from the Annand and the Symonds-Kaye properties, but there was a considerable decrease. In August this year A. P. McQuarrie was manager at the Annand mine and had twenty-eight men employed. Preparations were being made to erect a new mill. Wm. Skerry had fourteen men employed on the Symonds-Kaye property; T. M. Baker was working the Iron lead and Mr. Pratt the Sutherland mine.

In 1892, a London syndicate known as the Nova Scotia Mines Syndicate, Limited, acquired through Alfred Woodhouse the Annand, Lawson, Rose, and Montreal properties and carried on operations for a year or two, under the management of Lucius J. Boyd for a short time, and then of W. R. Thomas. In 1894 the Nova Scotia Gold Mines, Limited, took over the property, which continued under the management of W. R. Thomas. The mine was idle at the time of the inspector's visit in 1895, sold to A. P. McQuarrie on December 16 of the same year, and later passed into the hands of the Golden Group Mining Company, incorporated 1896, of which the directors were Messrs. Hayward, Andrews, and Bell.

Eighteen men were employed by the Salisbury Gold Mining Company in 1893 under the management of P. T. Pride; a 5-stamp mill was completed and ore was taken from the Maynard and Skerry leads. In December, Geo. H. Nissen took charge and worked the Skerry lead. The same year H. Lawson was manager at the Symonds-Kaye mine, where a 10-stamp mill brought from Margaret bay had been erected. This property had been purchased the preceding year by Lucius Boyd representing the Symonds-Kaye Syndicate, and A. P. McQuarrie had been made manager. On December 23, 1893, four men were drowned in the mine by a shot producing an opening between the new workings and some old workings which were filled with water, thus flooding the new level. The disaster was the result of a lack of proper plans of underground workings. Some crushing was done on this property in 1894, but it seems to have been idle in 1895. In[1] 1894 the Nissen mill on the Salisbury property was removed and foundations for another mill were laid.

The Golden Group Mining Company was working on the Belt or Lawson lead in 1897 under the management of A. A. Hayward, and the main shaft had, since September, 1896, been sunk 110 feet, so that its depth was then 340 feet. Work was continued here until the middle of 1898 and then attention was directed to the old Annand mine. This was opened after some time had been spent in putting in new machinery and refitting the mill, which then contained 15 stamps. Crushing from the Annand property began in October, but as the yield was unsatisfactory the work was discontinued.

Work on the Oland or Symonds-Kaye property resulted in some rich ore being taken from the Skerry lead east of the old mill in 1897, and work continued in a desultory fashion the following year, but with much less favourable results. During 1897 tributers did some work on the Skerry and Nugget leads as well as on the Salisbury property, and on this last property work was continued during the following year.

The Golden Group Mining Company had tributers at work on the Skerry lead under the management of D. McAskill in 1899 and 1900, and others worked different properties during these years on tribute. T. N. Baker carried on operations in 1910 to 1914, mainly if not wholly on the property of the Golden Group Mining Company.

The Loon Brook Gold Mining Company took over the Symonds-Kaye property in 1913 and carried on operations for a number of years under the management of E. S. Romilly Smith. Stoping was limited mainly to the Skerry lead below a fault dipping 45 degrees or 50 degrees to the south, the part of the vein above the fault having been worked previously. Operations were conducted from a shaft sunk on area 1344, 42 feet south of an old shaft on the Skerry lead. In the old shaft the fault was struck at a depth of 65 feet and in the new shaft at a depth of 106 feet. The property was taken over in 1917 by the Montague Gold Mining Company who also acquired the Golden Group property. The successors to this company, the Montague Goldfields, Limited, with E. S. Romilly Smith as manager, continued work on the Skerry lead until 1922. In 1923 the Clark Gold Mines Corporation, with E. S. Romilly Smith as manager, acquired nearly all the properties of Montague gold district and continued operations on the Skerry lead.

---

[1] Can. Min. Rev., Sept., 1894.

The shaft was carried to a depth of 325 feet, levels were driven at depths of 120 feet, 180 feet, and 300 feet, and mining operations had in 1923 been carried to a distance of 350 feet east and 680 feet west of the shaft. A crosscut was driven from the 300-foot level south 250 feet and north 44 feet. At a distance of 10 feet south the Ten-foot lead was struck. It was found to be auriferous and to have a thickness of 4 inches. The Nigger lead was cut at a distance of 57 feet. The belt, which is 5 feet wide, carries a 6-inch vein on the hanging-wall and a 2-inch vein on the foot-wall. Twenty-two leads in all were cut and on several of them short levels were driven and raises made to determine their value.

In 1921 a new shaft was started east of the 325-foot shaft and was later carried to a depth of 425 feet. A quantity of auriferous arsenopyrite has been obtained in recent years by the concentration of the tailings. In 1927 the Metals Mining and Smelting Corporation of Canada, Limited, working from the new shaft, did some drifting on the 300-foot and 400-foot levels and planned to carry operations to greater depth. Work on the Skerry lead was resumed by E. S. Romilly Smith in the summer of 1928. The tailings from a 10-stamp mill were concentrated, the concentrates carrying high values in gold.

The Skerry lead averaged 4 inches in width. The richest ore was found in shoots at the intersections of the lead with angulars, and at intervals the shoots carried pockets of extremely rich ore. The following figures of production indicate the richness of the ore from the Skerry lead: in 1916, 1,208 ounces from 390 tons; in 1917, 988 ounces from 294 tons; in 1918, 573 ounces from 227 tons; and in 1924, 292 ounces from 167 tons.

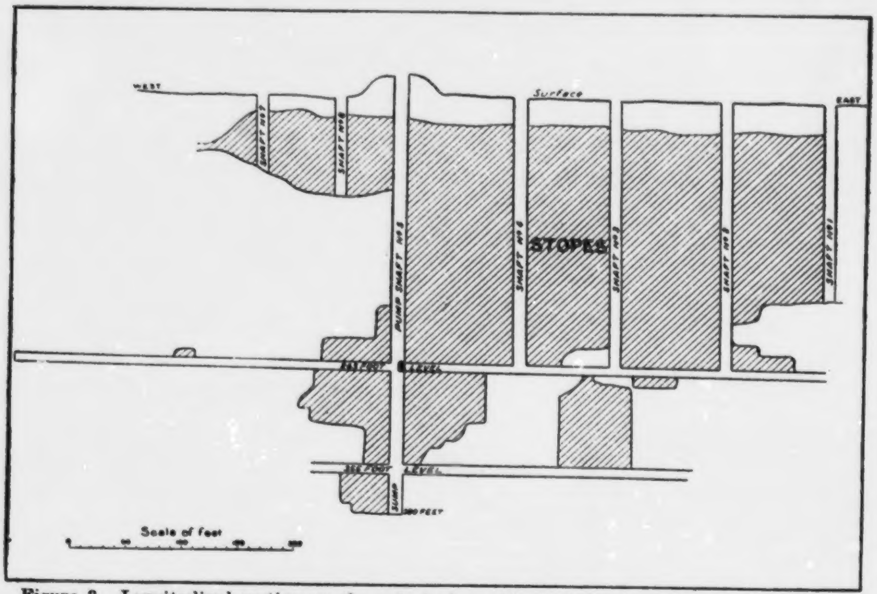

Figure 3. Longitudinal section on the principal workings of the Annand lead, Montague.

General Development

Little information on this point is available, but the published plan gives the location of the different shafts sunk, together with their depths. In a great many cases the most of the ground between the shafts has been worked out, so the plan gives a pretty good idea of the extent to which operations were carried on in the past.

The zone of special enrichment appears to run nearly parallel with the anticlinal axis. Speaking of the Lawson, Annand, Twin, and Rose leads, Faribault says:

"Although there is reason to believe that the limit of the pay-zone has not been reached on the above-mentioned leads, at the depths to which they have been worked, it is probable that in some of them the limit of the high-grade ore is near at hand. For the zone of rich streaks appears to be narrow, and as it is parallel with the axis-plane, it dips to the north at an angle of 80 degrees, whereas the dip of the veins is to the south, angle about 80 degrees, so that the two planes would give a diverging angle of 20 degrees, and so limit the length of the pay-streaks on individual veins. Thus, to keep in the pay zone it becomes necessary to crosscut north when the limit of the pay-streaks has been reached, and new veins will in this way be developed which might be barren or wanting on the surface." Three leads from which it would be especially advisable to crosscut are the Annand, Belt, and Rose.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1863	366	14	16	140	2	16	2
1864	649	8	23	304	2	12	17
1865	1,095	17	13	675	1	12	11
1866	707	1	1	563	1	5	3
1867	417	13	21	214	1	19	1
1868	603	16	17	380	1	11	19
1869	805	13	14	572	1	8	3
1870	3,831	9	5	916	4	3	14
1871	3,152	8	15	848	3	14	8
1872	1,793	10	6	683	2	12	17
1873	1,440	3	9	679	2	2	9
1874	655	0	22	496	1	6	10
1875	287	18	17	72	3	19	23
1876	149	1	17	81	1	16	19
1877	50	1	9	55		18	5
1878	158	6	12	192		16	12
1879	1,527	10	20	485	3	3	0
1880	4,270	8	17	1,221	3	9	22
1881	900	6	16	1,165		15	10
1882	684	9	22	586	1	3	8
1883	74	4	5	76		19	12
1884	736	12	23	539	1	7	8
1885	4,001	6	2	2,809	1	8	4
1886	87	14	0	77	1	2	18
1889	1,901	10	6	953	1	19	21
1890	2,263	1	0	1,411	1	12	0
1891	1,361	1	0	863	1	11	10
1892	2,201	10	0	1,716	1	5	15
1893	511	11	8	740		13	19
1897	1,177	1	7	956	1	0	6
1898	1,254	10	23	2,112		11	21
1899	976	14	18	1,816		10	18
1900	481	3	7	636		15	3
1901	437	15	2	595		14	17
1908	1	15	0	(Mortared)			
1909	1	15	15	(Mortared)			
1910	161	6	1	304		10	15
1911	24	2	0	41		11	18
1913	18	16	3	99		3	19
1914	40	12	23	118		6	21
1915	135	10	0	61	2	4	10
1916	1,207	10	0	390	3	1	22
1917	992	12	0	294	3	7	13
1918	572	16	11	227	2	16	6
1919	496	0	0	258	1	17	16
1920	454	19	9	285	1	11	22
1921	159	12	0	80	1	19	21
1922	106	7	0	53	2	0	3
1924	292	0	0	167	1	14	23
1925	20	0	0	20	1	0	0
	45,696	14	0	28,064½			

MOOSEHEAD

Moosehead (or Shears Point) lies in the eastern end of Halifax county, 2 miles south of Moser river. It lies on the Tangier-Harrigan Cove anticline between Harrigan Cove and Ecum-Secum. The deposit that has received the most attention is a 20-inch quartz vein lying in a 4-foot slate bed dipping south 45 degrees. A little work was done here prior to 1873, and again in 1874, when 12 tons of ore was crushed. In 1880 Campbell and Smith were engaged in erecting a mill and in opening some lodes, but little was done the following year. In 1899 a company began in April to erect a modern mill under the management of Edward Brownell, but in June a fire destroyed the nearly completed structure together with boarding-house and barn. The company began to rebuild at once, but early in July of the following year the mill and entire surface plant were again destroyed by fire. Operations on the Hulk lead of this property were renewed in 1911 by the Boston and Goldenville Gold Mining Company. The main shaft, 200 feet deep, from the bottom of which levels had been driven about 200 feet east and 200 feet west, was unwatered and a small quantity of ore was taken from a 65-foot shaft. In 1912 and 1913 drifts on the 200-foot level were extended and in 1912, 69 ounces of gold was recovered from 171 tons of ore, and in 1913, 21 ounces from 407 tons. Crosscuts 125 feet in length were driven and shafts were sunk at least 50 feet and 25 feet deep, respectively, on the Hulk and Slate leads west of the main workings. In 1914 and 1915 J. Paul Norrie mined the 22-inch Camp Cove lead and in the latter year recovered 26 ounces of gold from 251 tons of ore. The shaft was carried to a depth of 93 feet and the drift on the 46-foot level reached a length west of 79 feet and east of 38 feet.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1911	7	6	0	14		10	10
1912	69	10	0	171		8	3
1913	82	19	0	563		2	23
1915	26	4	12	251		2	2
	185	19	12	999			

MOOSELAND[1]

Location

Mooseland gold district is situated in the eastern part of Halifax county 12 miles northwest of Tangier gold district, from which it is accessible by a wagon road. It can also be reached by wagon road from Shubenacadie.

Geology

The Goldenville formation is here exposed in a closely folded anticline. The anticline plunges to the east and west forming an elongated dome, the plunge to the east being 10 degrees and to the west 5 degrees. The dip of the strata increases very rapidly and at a distance of 50 to 100 feet from the axis reaches 75 degrees to 80 degrees. The axis does not form a straight line, but curves with its convex face to the south, and from the centre of the dome runs approximately east (magnetic), and in the opposite direction north 80 degrees west (magnetic).

"Several lines[2] of faulting have caused important displacements at the east end of the district. The westernmost of these runs south 35 degrees east (magnetic) along the edge of a flat on the west side of Tangier river and gives a horizontal displacement of 560 feet to the north on the east side, the anticline situated 48 feet north of the Irving lead being the same as that immediately south of the Bismarck lead.

---

[1] Plan published.

[2] Faribault, E. R.: Geol. Surv., Canada, vol. X, pt. A, p. 1 4.

On the east side of Tangier river, another main fault, running parallel with the first, passes through the west Otter pond and follows its brook to the south, while northward it follows the river along Grassy lake. The Bismarck lead anticline is shoved 1,500 feet to the north on the east side of this fault, to a ridge 150 feet north of the west Otter pond, and 50 or 100 feet north of the Brown lead opened here. The pitch of the anticline, which is to the east on the Bismarck lead, is changed to the west on the east side of the fault where the veins will curve westward around the fold. Small faults exist no doubt between this fault and the Bismarck lead, and one was located at the east end of the workings on this lead, but a great thickness of drift east of the river prevents the determination of others."

A large granite mass lies immediately to the southwest of the district.

Character of the Deposits

The veins are of the interstratified type and among the most important may be mentioned the Bismarck, Irving, Little North, Specimen, Cummings, and Furnace, the last named being the first vein worked in the province. Nearly all the operations have been limited to the south limb of the anticline, and as the axial plane is vertical this deposition of the ore on the one side only may be due to the difference in structure dependent on the curving of the anticlinal axis. The zone of enrichment lies close to the axis, as is generally the case in close folds.

A large belt of four veins, giving 15 feet of quartz in the space of 35 feet, has been exposed for 1,850 feet along the apex of the anticline north of the Irving lead. At the south end of Moose lake a few veins have been traced to the granite. They show no disturbance from the intrusion.

In the veins on the apex of the fold several geodes containing quartz crystals were found, and in the Irving lead crystals of rutile were found in the quartz.

History

Mooseland has to its credit the first discovery of auriferous quartz, leading to the beginning of the gold mining industry in Nova Scotia. The first find[1] was made by Captain L'Estrange in September, 1858, but it led to nothing further. In May, 1860, John Pulsiver, accompanied by one of Captain L'Estrange's Indian guides, happened upon the same spot and discovered auriferous boulders; the discovery was made known,[2] and in that same year mining operations were started by John Morrell on the Furnace lode. In April, the next year, the district was proclaimed and surveyed.

"Among the early workers of this district were W. H. Newman,[3] Henry Hesselein, and Mr. Ellershausen. They began operations in 1861 and continued intermittent work for several years. The first stamp mill, consisting of four wooden stamps, was erected in 1862 by Ellershausen, but this was replaced by a better mill erected the next year by Newman. C. E. Willis[4] states that the first mill of the province was erected at Mooseland, afterwards taken to Tangier, then to Chezzetcook. The first apparatus for extracting gold at Mooseland is described by J. H. Townsend as [5]"a large, flat rock with a slight incline to the north, the direction I believe is important, on account of the electrical affinities. In the centre is a hole, which extends through a smaller stone, the grinder; in the underside of the grinder is a concave opening for the insertion of the ore, and in the mill itself, that is the larger rock, is cut a groove for carrying off the slimes."

For a few years after discovery little progress was made in this district owing to the difficulty of access, but by 1866 a passable road was completed and mining recommenced with vigour. During 1866-8, Messrs. Adams and Company, otherwise known as the Beneficiary Gold Mining Company, carried on work on the Furnace, Camminger, and Specimen leads, sinking several shafts and doing considerable stoping. In 1868 Andrew Barton and David Estey opened several veins south of Sluice lake, but they were never developed and probably are of little value.

---

[1] Heatherington, A.: "Guide to the Gold Fields of Nova Scotia," p. 31.

[2] Industrial Advocate, June, 1899, p. 16.

[3] Ind. Adv., June, 1899, p. 16.

[4] Trans. Min. Soc., Nova Scotia, vol. I, pt. II, p. 6.

[5] The 'Critic,' Nov. 11, 1887.

In 1869, the Adams Company sold out their mining interests to Fletcher, Crossland, and Company, who became known as the Humber Gold Mining Company. During this year the Irving belt was discovered and this was worked by the Humber Company until 1871, the ore being crushed at their 8-stamp mill. In 1870, a 450-foot drainage tunnel was driven on the Irving belt from the water level of the river, and from this a 100-foot crosscut was run to the south, which intersected the North, Specimen, and Cummings leads. During this year work was done on the Furnace, North, Specimen, and Irving leads and continued on the last lead during the following year.

For several years after this, work in this district was carried on by tributers, chief among whom was Mr. J. Irving. During 1872, he worked the Irving and Furnace leads and continued to employ a few men for several years, sinking and stoping. In 1876 and 1877 a little work was done in the Irving and Cumminger leads, and in 1879 on the Irving. In 1881, Mr. Crossland ran a crosscut north from the Irving lode to intersect some parallel veins. In the eighties, Mr. Irving and others did some tributing on the property of the Humber Company, principally on the Irving, Furnace, and Edwards leads.

In 1884, a number of auriferous boulders were found on the west side of the river in that part of the district known as North Mooseland, and as a result of the interest thus aroused a great deal of prospecting was carried on for a few years and several leads were discovered. In 1890, Mr. Stemshorn discovered the Bismarck lead, and the same year the Mooseland Gold Mining Company was organised to work it. The next year a 5-stamp mill was erected and operations were carried on for a few years under the management of H. G. Stemshorn. The production was: 1892, 373 ounces from 893 tons of ore; 1893, 471 ounces from 1,323 tons; 1894, 434 ounces from 1,355 tons. In 1893 the district lost its chief pioneer by the death of J. Irving. In 1895 there was a new 10-stamp mill at work and 25 men were employed.

In 1896, Wm. Yeadon did some work on the Cummings belt, having acquired the Musgrave areas, so-called from the name of an Englishman who had undertaken to do a little mining here in 1882. In 1898 this property had been purchased by the Arlington Gold Mining Company—J. H. Greene, manager—and an angular crossing the workings on the Lake lead was worked. There was an old 4-stamp mill on the property, run by an upright engine; the destruction of this mill by fire put an end to the work in December of this year. Operations were resumed by this company under the management of J. A. Reynolds in December, 1889, and preparations were made for erecting a 5-stamp mill. In 1901 the mill was completed and the shaft on the Cummings belt was continued to a depth of 100 feet. In 1903 work was started again on the shaft, the intention being to sink it to a depth of 150 feet, and a small amount of work was reported in 1910, 1911, and 1914. Little or nothing, however, has been accomplished in this district in recent years. The history would be incomplete without the mention of John Murphy, who is well known for the great amount of prospecting he did in this district.

General Development

There is little other information available on this point besides that contained on the published plan. Since its publication in 1899 the 50-foot shaft on the Cummings lead was carried to a depth of 160 feet and a crosscut was driven some distance north.

The large belt of veins on the apex of the anticline might be worth testing on their eastern pitch and at greater depths on the south leg. They are probably underlain by other saddle veins that should be taken into consideration in the question of deep mining. The anticline east of Otter pond also seems favourable ground for prospecting.

The production of this district is included in that of Tangier.

MOOSE RIVER[1]

Location

Moose River gold district lies in Halifax county, about 34 miles to the southeast of Shubenacadie, a station on the Intercolonial railway, from which it is accessible by a good wagon road. It can also be reached from Tangier on the coast to the southeast, by means of the Mooseland road running northwest through Mooseland and 2 or 3 miles east of Moose river.

---

[1] Plan published.

Geology

The district is situated in the centre of a wide zone of the interbedded slates and quartzites of the Goldenville formation. In this locality is exposed a greater thickness of this formation than is exposed in any other part of the province, calculated by Faribault to be 16,000 feet, and by Woodman 16,900 feet. "North[1] of the settlement, beginning two or three areas beyond the Cooper lead, the rocks are chiefly quartzite for nearly 3 miles. Here and there thin slate strata are intercalated, but the proportion of argillaceous material is small. South of the mines, starting at the third or fourth tier of areas south of block 1, quartzite again stretches for several miles. The exact proximal limits of these whin zones cannot be given, on account of the few natural outcrops and the absence of artificial openings; but the margin of error is small.

Between these limiting whin areas is a broad belt characterized by lustrous black slate, often somewhat schistose; essentially different from the slate of the Halifax formation, which is well exposed on the road north from the mines. There are quartzite strata within this zone, but they are comparatively few and narrow. In them, as in the more abundant ones to the north, slate lenses with rounded edges are occasionally found. It is the extent of this slate belt, at least 1,500 feet wide across the strike, which constitutes one of the unique features of the district. All the ore-bearing veins are situated in it, even though many of them lie at the contact of slate with thin strata of quartzite." On the published plan Faribault indicates a slate zone extending from the Little North to the Comstock lead, a distance of 750 feet.

The structure of the rocks of this district is much complicated by the converging of two main anticlines and the development of subordinate folds, and by several faults crossing the strata in a north and south direction. The Fifteenmile stream[2] and the Beaver Dam anticlines converge as they approach this district from the east and are here only 450 feet apart, with two minor plications between them. The folds have a general east and west course. The most northerly, which is the most important, has a north dip increasing gradually from 35 degrees to 80 degrees and its axis has a pitch to the west at an angle of 10 degrees. The measures on the south side of the south fold dip south at an angle averaging 60 degrees, and the axis has a pitch to the east at an angle of 15 degrees, and the minor intervening plications lie at an angle seldom higher than 45 degrees." These minor folds probably flatten out and are lost at no great distance to the east and west, whereas the main anticlines converge into one some distance to the west of the district. The numerous folds produce the result that sediments of no great thickness stretch over a wider zone than is usual with strata of similar thickness of the Gold-bearing series and between No. 7 in area 170 on the north and the veins in the centre of area 970, block 4, on the south, the total thickness involved is only about 370 feet. The main lines of faulting have a general course varying from north 10 degrees east to north 25 degrees east (magnetic), with displacement from a few feet up to 165 feet, generally towards the north on the east side. In addition to these, minor faults are constantly being met with. These are in every conceivable attitude, some along the plane of stratification or along the planes of cleavage, the most, however, transverse to both. Their displacement is slight and as they generally exercise a compensating rather than a cumulative effect, they do not alter the structure of any portion of the district to an appreciable extent. The geological structure as interpreted by Faribault is represented on the published plan of the district.

Some considerable time was spent by Woodman in a detailed study of this district, and his map published in 1904, although slightly more detailed, corresponds closely with that published by the Geological Survey in 1898. In his report[3] the structure is described in minute detail, the district being divided into four sections by the main faults and the folds in each being described, along with such evidence bearing on them as could be obtained from a study of the outcrops and of the rocks exposed in mining operations. The faults, which in this district are not radial in character, were closely studied and described under the headings: course, details of displacements, limits of dislocation, and direction and character of movement. Owing to the lack of determining evidence there is necessarily in many cases considerable speculation.

---

[1] Woodman, J. E.: Trans. of the N.S. Inst. Sci., vol. XI, pt. I, p. 25.
[2] Faribault, E. R.: Geol. Surv., Canada, Ann. Rept., vol. X, pt. A, p. 113.
[3] Trans. of the N.S. Inst. Sci., vol. XI, pt. I, pp. 16-66.

The slates[1] are found to be composed chiefly of kaolin. A small amount of chlorite is revealed by the microscope. Locally the slates are altered into knotted schists, the knots being distributed in the direction of cleavage and consisting of calcite, quartz grains, or indeterminate masses looking almost like decomposed feldspar. The quartzites are composed chiefly of well-rounded grains of quartz cemented by silica and calcite. The microscope revealed no feldspar and very little kaolin except in the finer whin. There is quite a lot of muscovite and biotite, some of which is evidently secondary, but some of which, especially of the biotite, was of clastic origin.

The planes of fissility are parallel to the general strike of the rocks, but the quartzite very little, and it is usually on weathered surfaces that the incipient fissility in the latter has been brought out. The quartz grains show no elongation and the secondary minerals do not appear to form distinct bands giving schistosity or cleavage. In the slates the "fissility results chiefly from a rearrangement of the kaolin, so that it lies in the cleavage bands rather than in those of stratification. It is aided, but probably not formed, by secondary minerals. Those rocks which in the hand specimen appear most schistose, even the fine, knotted schists mentioned above, have only a slightly larger amount of secondary material, the schistosity being due to a microscopical wavy cleavage that seems to be crenulated without much regard to the knots of quartz or other minerals. It is this crenulation which, in part at least, gives the lustrous and silky appearance to the schists."

Character of the Deposits

With the exception of one or two small, unimportant veins that cut the strata at small angles, all the veins worked in this district are of the interbedded type. With these are connected the angulars, which cut the strata but usually have a strike similar to that of the interbedded veins. The veins show the usual corrugations and rolls so characteristic of Nova Scotian gold veins.

"The gangue[2] in the veins of Moose River is chiefly quartz with some calcite. Most of the leads have shown only quartz, and the cross veins appear to have no other gangue. The Little North has much calcite, and a few others have large amounts erratically distributed; but in no case does it form the main part of the lead. It is mixed with the quartz without apparent system, sometimes occupying the whole width of the vein, again next the country rock, often in the centre; or in a few instances interbanded with quartz in distinct layers....

The quartz is rarely cellular or drusy. A few druses show very distinct crystal faces on the walls. The cellular portions of the gangue are especially white or are rusted by decomposition of a sulphide. Normally, however, the gangue is dark and ribbony, and uniformly dense. The gold is associated with this type, on the whole, more than any other."

Although considerable work has been done on the south anticline and on the two minor folds, the most important veins are those worked on the north dip and on the crown of the northern anticline.

Most of the veins, as has been pointed out, lie in the stratification planes, and in their folding and faulting partake of the peculiarities of the sediments. Although in most districts the veins lie in narrow slate beds interstratified with whin and are found in contact with the whin, in this district the slate is very abundant and the veins are frequently found at horizons where there is no quartzite for a wall. Notwithstanding this, the proportion of veins that break across from one bed to another is exceedingly small, and where such does occur it is within narrow limits, so that the lead is confined to a narrow belt of slate just as in the case where there are whin walls. In some cases only a portion of the vein crosses the bedding and the lead thus becomes bifurcated. In some instances a belt is found to be composed of a series of intermeshing angulars, without any single lead that is strictly interstratified. The best example of such belt is the Kaulback belt, opened in 1901.

---

[1] Trans. N.S. Inst. Sci., vol. XI, pt. I, p. 38.

[2] Woodman, J. E.: Trans. N.S. Inst. Sci., vol. XI, pt. I, p. 89.

The corrugations and rolls have here the same effect on the country rock as in other districts, sympathetic folding taking place, but rarely extending more than 2 feet from the lead. Both joints and cleavage are turned from their course where they approach the crest of a corrugation, the joints being broadly curved and the cleavage sharply.

Following is a brief description of the most important leads of the district:

Copper lead, two veins 3 and 4 inches thick in a slate belt of several feet.

Little North, two leads with 2 feet of rock between them composed of slate with a little quartzite. This gives towards the ends 2 feet of crushing material.

Little South, a thin corrugated lead with soft slate adjacent to it giving a foot of crushing material.

Big North is in a belt with a whin hanging-wall. The vein which lies on this wall is 4 inches thick at the west, thickens to 8 inches towards the east, where it is called the North Sutherland, and at the east end thins again to 5 inches. Rolls dipping to the west are prominent at the west end.

The Serpent varies from 2 to 18 inches in thickness and is extremely well but unevenly corrugated.

The Kaulback belt consists of two veins 2 feet apart at the surface, but starting to diverge at a depth of 12 or 15 feet and being 5 or 6 feet apart at a depth of 170 feet. At various points they break up into stringers which sometimes reunite.

The Comstock, 5 to 7 inches, with rolls, has been traced from one end of the district to the other, and shows the displacement of the main faults.

About a mile west of the main deposits is the West mine, where several leads have been opened, some of which show distinct rolls pitching west.

Other less important veins are indicated on the plan published in 1898, and since its publication a number of new leads have been found and some of them worked more or less.

History

It[1] is said that gold was discovered in this district in 1866 by some lumbermen engaged in blasting rock from the river, and the 'Critic' of September 8, 1893, in quoting the Truro *News*, states that the discovery was made by John Pulsifer, St. Andrews, and the Messrs. Taylor, Musquodoboit, this being the John Pulsifer who made the discovery at Mooseland. Mr. D. Touquoy took up some property, but it was not until 1876 that the place aroused any interest. In that year the district was surveyed and prospecting was carried on.

In 1877 the prospects were bright. The yield from a little flat lead, dipping north, and owned by Mr. Hilts, was very encouraging, but the principal mining was done on a south-dipping lead on area 25, where a shaft was sunk to a depth of 30 feet. The next year a double lead of 2 inches and 5 inches was traced from area 172 across areas 173 and 174 and on to 126, and some portions of this yielded over one ounce to the ton. Exploration trenches in its vicinity failed to reveal more than three small lodes. A 7-inch lead was uncovered south of the Comstock, giving a yield of 17 hundredweight. An attempt was made to wash the alluvium, but it did not prove satisfactory. "For this purpose a race about half a mile long was made, and two flumes, each about 200 feet long, were built. The sluice in which the washing was done was over 300 feet long, but had not the fall that was desirable to clear itself."

Some fair returns were made in 1879, a lot of 29 tons from area 27 giving 32 ounces, and 135 tons from area 172 giving 137 ounces. In 1880, several lodes received attention. Mr. Cole sank two shafts and stoped the Little South and Sutherland North lodes, and late in the autumn Messrs. Foster and Cole reopened the Comstock lode. Messrs. Walton and Dunbrack worked on area 131, and Mr. Taylor and others worked on a lode presenting the form of an anticline pitching east and with a subordinate syncline on the apex. Mr. Sutherland worked on the east side of the road on a flat lode dipping north. Some discoveries were made by Mr. Zwicker a mile to the west.

In 1881, D. Archibald worked the Walton lode and Mr. Touquoy worked on area 131 and at other points. Mr. Cole continued operations, but later in the year his areas and the Foster property and mill were purchased and preparations were made for work on a large scale. The purchase was probably made by the Moose River Gold Mining Company, Limited, which was organised this year. The following year this company made preparations for extensive work, the Foster mill was united to a new mill, giving twenty stamps in all driven by steam; a Frue vanner was put in for treating the tailings and an air compressor and other very expensive machinery erected. Two shafts were sunk on the North Sutherland lode to depths of 150 and 200 feet, respectively, and regular stoping was carried on.

---

[1] Rept. Dept. of Mines, N.S., 1898, p. 36.

In 1883 Mr. Touquoy sank two shafts on the Little North lead to the west of the property of the Moose River Gold Mining Company, Limited. This company suspended operations and let the North, Comstock, and other leads to tributers. Henry Archibald did some prospecting at the west end of the district.

For many years tributing was successfully carried on on the property of the Moose River Gold Mining Company, Limited. In 1884, Messrs. Taylor and Walker worked the North, Copper, and Little North leads. In 1885, the Little North was worked on tribute, and the following year, it and the Copper lead.

In 1884 Mr. Touquoy worked the Little North and Copper leads in the spring, and later in the season sank 30 feet on the North lode. The following year he did some prospecting and was rewarded by the discovery of an 8-inch lead yielding about 1 ounce per ton. In 1886, he worked the Little North, Copper, North, and South leads, the last being a saddle vein pitching to the west. This year Mr. Bruce prospected the Taylor and Archibald properties and worked two small, rich veins on the latter.

In 1887, mining was carried on by Messrs. Touquoy, Bruce, and McGregor. Mr. Touquoy worked the South lead, the Serpent, and the North. This year he started the erection of a 15-stamp mill to be driven by waterpower furnished by Moose river, from which, by means of a dam, an 11-foot head was obtained. A dam at the foot of Long lake, a short distance to the north, retained a supply of water in this reservoir sufficient to provide power continuously. Wm. Bruce worked on the South lead on the areas adjoining Mr. Touquoy's, and Mr. McGregor worked on the property of the Moose River Gold Mining Company, Limited, crushing at a 10-stamp waterpower mill, just north of the district. The next year Mr. Touquoy's mill was completed and a lot of surface material was crushed and tribute work continued on the other properties.

For several years this district continued to be a steady producer, Mr. Touquoy crushing a large amount of surface material in addition to the quartz from the veins, and tribute work being conducted on the property to the east, chiefly by Messrs. McGregor and Bruce.

In 1893, Mr. Touquoy employed twenty men on the Copper and Taylor leads and a large quantity of slate with small quartz veins was crushed. A. McGregor had twenty-two men at work on the property of the Moose River Gold Mining Company, Limited. This company is frequently designated the Montreal Mining Company. The next year four tributers were at work on this property: Robert Russell with six men, Andrew McGregor with three men, James Dull with six, and Charles Stevens with four men. The same year Mr. Touquoy continued operations.

In 1895, Mr. Touquoy worked the North and Copper leads and crushed a lot of surface material. During the next year the North lode was idle, but about 600 tons per month were taken from a 6-foot belt of low-grade ore. Tributing continued on the Montreal property in 1895, Arthur Higgins employing thirteen men, H. Wilson, six men, and Robert Russell six men in a 70-foot shaft on the Copper lead. The next year this property was worked by A. McGregor with twelve men, and John Reynolds with ten men worked the Little Copper lead. McGregor also did some work in an old shaft east of the Touquoy property and John Reynolds took up some claims east of the Touquoy property and sank two shafts about 15 feet deep, one on a 3-foot belt and the other on a 5-inch lead. Nathan Higgins also employed three men on Reynold's property on what is known as the Canaan lead which had been opened 12 years previously.

In 1897, John Reynolds was manager for the Touquoy Gold Mining Company, had thirty-two men employed, and was taking ore from the Little North lead and the Britannia lead on which a 100-ounce pocket was found. It[1] is said that during the previous seven years gold to the value of $110,000 had been won from this property. Operations at the Touquoy mine present an excellent example of economy in gold mining. The 15-stamp mill was driven by waterpower, and in 1890[2] surface material running fror 75 cents to $1 per ton was profitably milled, the whole expenses connected therewith being only 40 cents per ton. In 1894,[3] the yield was 342 ounces from 4,131 tons; in 1895, 405 ounces from 5,174 tons; and in 1896, 629 ounces from 5,887 tons. Work continued on the Britannia lead in 1898 under the management of J. A. Fraser, and two Frue vanners were put in for concentrating.

In 1897, J. K. Pearson did some work on the Donald Archibald property, one mile west of the Touquoy property, and in a trench 600 feet long had exposed 14 leads, varying in thicknes from 3 to 12 inches, and 5 belts, 3 to 9 feet wide. George Cameron opened two belts, 3 feet and 14 inches thick, respectively, on some areas, owned by John Emmett and S. Smith, east of the Touquoy property. A. McGregor worked on the Montreal property on a large belt on the east side of the road, between the Emmett and Touquoy properties. The next year he was engaged in quarry work and had reached a depth of 60 feet. The whole of the 20-foot belt was crushed, although it yielded less than $2 per ton; this mode of mining, however, is cheap and the ore was crushed at the 10-stamp waterpower mill.

In 1898, the Colonial Mining Company had five or six men employed, and quarrying was carried on under the management of J. K. Pearson. The rock and surface material were crushed at a 10-stamp mill, built near the river south of Touquoy's mill. In May, the next year, the mill was destroyed by fire and after that exploration by trenching was prosecuted and a number of veins were discovered.

David Patriquin was manager for the Touquoy Gold Mining Company in 1899 and 1900. In 1899, the Britannia and Serpent leads were worked, and in the following year a large number of men were employed and the Little North lead was reopened. Not only the 15-stamp mill, but also the 4-drill air compressor, was driven by waterpower.

An 8-stamp mill was erected in 1899 by the Reynolds Bros. Gold Mining Company, and open-cut mining was done on a belt on the apex of an anticlinal fold. The belt in the north limb was 4 feet thick and nearly all milling material.

On the Moose River Gold Mining Company's property A. McGregor continued his quarry work in 1899 and 1900. In 1899, some tributers were also sinking on the Moleskin lead and had carried a shaft to a depth of 50 feet.

In 1900, the Colonial Gold Mining Company—Robt. Kaulback, superintendent —sank a shaft on a new lead a short distance from the Touquoy areas. The following year this property and that of the Touquoy Gold Mining Company were operated by the same staff, with Robert Kaulback as manager. On the Touquoy property a shaft was sunk that cut at a depth of 60 feet a 'large slate fissure belt' containing two quartz veins, and 46 feet east of this shaft a shaft was sunk on the same belt on the Colonial property. On both properties crosscuts were driven and on the latter the New lead was cut in a crosscut driven to the south.

In 1902, R. Kaulback continued work for the Touquoy Gold Mining Company, and the shaft on the 'slate fissure belt' was continued on an angle to a depth of over 200 feet and at a depth of 180 feet a raise was made to meet a shaft driven from the surface in the Doull lead. A shaft was sunk 90 feet on the Doull lead and a crosscut was driven to the Colonial shaft. A new shaft was sunk on the Taylor lead and a crosscut 125 feet long connected this with the Touquoy shaft. This year the Colonial Company's areas were bonded to Gladwin Bros. and work commenced in August under the management of J. Reynolds. W. Reynolds did a little tributing on the Moleskin lead and A. McGregor on the Montreal property.

The old workings on the Touquoy Gold Mining Company's property were practically abandoned in 1904, and a new shaft was sunk 108 feet west of the Doull or main shaft and 28 feet south of the outcrop of the Britannia lead. In this shaft two leads were cut, and crosscutting was started. The next year R. Kaulback, manager, did more crosscutting, drifting, and stoping.

---

[1] Can. Min. Man., 1897, p. 201.
[2] The 'Critic,' Nov. 14, 1890.
[3] Can. Min. Man., 1897, p. 201.

In 1904, the G. and K. Gold Mining Company erected a 40-stamp mill and conducted operations on the old Colonial property, working an open-cut on the Joe Taylor belt, which is thought to be the Britannia on the east side of the fault. They also sank a shaft 170 feet deep on the Bruce belt, also known as the Meagher belt. The next year levels and crosscuts were driven and some ore stoped. A crosscut driven north intersected the Archibald lead. Work continued in 1906 under the management of W. C. Guilford and the shaft on the Meagher belt was carried to a depth of 239 feet. Driving and stoping were carried on until the middle of March and in July work ceased, but was resumed later.

Early in 1906 the property of the Touquoy Gold Mining Company passed into the hands of Robert Kaulback and others and work commenced in July. The mill was repaired and the next year 268 ounces were extracted from 1,255 tons, taken chiefly from No. 3 belt, which averages 7 feet in width and is composed of heavily mineralized slate and quartz. W. H. Gladwin operated a part of the year on tribute.

In 1907, the Consolidated Mines of Canada, Limited, mined the property formerly owned by the G. and K. Gold Mining Company, and 219 ounces of gold was extracted from 2,895 tons of ore. In May, work was temporarily discontinued, but in October the shaft on the Meagher belt was unwatered. A crosscut to the north cuts the Minnie Miller, McCallum, Catherine, and Archibald leads. In 1908, fifty-five men were employed, under the management of W. C. Guilford, and 844 ounces of gold was recovered from 8,326 tons of quartz and slate. Operations were conducted at the Meagher belt, the West shaft, Cameron or East shaft, and the Root-Hog lead.

The Minnie Miller and McCallum leads were stoped, a shaft sunk on the Root-Hog about 100 feet south of the crusher, and on the Cameron lead, a short distance north of the Moose River crusher, a shaft was sunk and short levels and a crosscut driven. In the western part of the district on areas known as the Johnson areas, a promising lead had been cut in 1907, and in 1908 W. C. Guilford sank a shaft on the adjoining areas to cut it. The lead was not cut at a depth of 60 feet and the shaft was allowed to fill with water.

The Kaulback property was worked about three months this year and produced 31 ounces of gold.

In 1909 the Consolidated Mines Company of Canada, Limited, carried on operations at different periods at the Archibald shaft on the Archibald belt, recovering 539 ounces of gold from 6,344 tons of ore. The No. 3 belt on the Touquoy property was worked this year under the management of M. R. O'Shaughnessy for M. J. O'Brien, and 539 ounces of gold was recovered from 3,135 tons of ore.

Work was continued in 1910 and the Dowell, Taylor, Britannia, and Big North leads were tested. Prospecting was carried on in 1911 and 1912.

The property on which the M. J. O'Brien interests had been working was taken over by Robert Kaulback and others and in 1912, 1913, 1915, and 1916 they worked different leads from the Dowell, Britannia, and Touquoy shafts.

In 1910 the Stillwater Mining Company worked the Johnson mine where a 4-foot belt contains 18 inches of crushing material and dips south 73 degrees. In 1911 the shaft, which was 105 feet deep, was deepened to 140 feet, a level at a depth of 130 feet was driven east 90 feet and west 64 feet, and the ore stoped on the east to a height of 50 feet above the level. In 1912 the east drift was extended 54 feet and the ore of this belt above the 130-foot level was nearly all removed and crushed. A crosscut driven north 92 feet intersected ten veins ranging from ½ inch to 36 inches in width and one driven south 108 feet intersected seven veins ranging from ½ inch to 18 inches in width. A small amount of ore was mined in 1914. During these years a certain amount of work was done by tributers in other parts of the district.

In 1924 and 1925 work on what was formerly known as the Touquoy property was carried on by the Maritime Gold Mines, Limited, under the managership of R. G. E. Burroughs. A vertical shaft was sunk to a depth of 88 feet on the west side of Moose river. At this depth a crosscut was driven north 25 feet and south 450 feet. It cut several quartz veins and a large body of arsenopyrite-bearing slate from which a quantity of arsenopyrite was concentrated.[1] In 1926 a small amount of ore from the Root-Hog property was crushed by the Maritime Gold Mines, Limited.

---

[1] Kerr, F. A.: Geol. Surv., Canada, Econ. Geol. Series 4, pp. 138-140 (1927).

General Development

The extent of the operations can be learned from the published plan for which the survey was made in 1897. The following notes taken from the report of the Department of Mines, N.S., will give some idea of the work of more recent years:

1902. The Torquoy Mining Company. "A new shaft 90 feet deep has been sunk during the year, on the 'Doull' lead, and from 50 feet to the bottom a block of ore 15 feet wide has been worked out on the east side.

At this 50-foot level a drift is in 20 feet west, and a crosscut has been driven north 27 feet to the Colonial shaft.

The Touquoy shaft, 30 feet west of the Colonial shaft, has been continued on the large slate fissure for over 200 feet.

At 180 feet, an upraise has been made to meet a shaft driven from the surface on the Doull lead.

A block of ore has been stoped here for about 50 feet in length and 30 feet high......

At a depth of about 70 feet a new shaft on the 'Taylor' lead, has been connected with the Touquoy shaft by a crosscut 125 feet long."

1904. Touquoy Gold Mining Company. A new three-compartment shaft was sunk 109 feet west of the "Doull" or No. 3 shaft, and at a depth of 122 feet a crosscut was driven south, which cuts three belts of ore.

1905. Touquoy Gold Mining Company. The vertical shaft was continued to a depth of 185 feet, and another crosscut driven at a depth of 170 feet for a distance of 125 feet north and 107 feet south.

"At a distance of 45 feet south from the shaft a drift was run east 45 feet, and intersected the ore-shoot containing the corrugated quartz, which had been worked from the surface down to a point 12 feet above the end of this drift. A raise was made to connect with the old workings, and the small body of ore remaining above was worked out. A winze also was sunk here for a depth of 25 feet to follow the 'shoot' on its pitch, southwesterly. A horizontally inclined fault, which shifts the strata below the fault plane about 8 feet to the north, was encountered in this winze.

Farther to the south in this crosscut two drifts were made, the first 55 feet east and 25 feet west, and the second a few feet east."

1905 and 1906. A shaft on the Meagher belt worked by the G. and K. Company had, in 1906, reached a depth of 239 feet on an inclination of 36 degrees and at a depth of 150 feet levels had been driven each way about 90 feet. A crosscut had also been driven north 212 feet.

1907. This belt was being worked by the Consolidated Mines of Canada, Limited. The 150-foot level was then 80 feet east and 110 feet west; the 225-foot level was in 60 feet east and 100 feet west. From the latter and from a point 38 feet west of the shaft a crosscut was driven about 70 feet cutting the Minnie Miller, McCallum, Catharine, and Archibald leads.

1908. Consolidated Mines of Canada, Limited. Work was done chiefly on the Meagher, Minnie Miller, and McCallum belts. Levels were driven as follows: Meagher, east 75 feet and west 64 feet; Minnie Miller, east 164 feet and west 75 feet; McCallum, east 98 feet and west 95 feet. Stoping was conducted on the last two leads, and the main shaft was carried to a depth of 325 feet.

A shaft was also sunk 112 feet on the Root-Hog lead, and at a short distance north of the Moose River crusher a 100-foot shaft was sunk on the Cameron lead, a level driven west 30 feet at the bottom, and a crosscut from this level north 28 feet. The Cameron lead is about 18 inches wide, carries much mispickel, strikes north 70 degrees east, and dips south 59 degrees.

1909. M. J. O'Brien. "On No. 3 belt, so-called, a winze has been sunk 55 feet, from the 200-foot level, and a level driven west 106 feet; the belt to the west for the total distance has been stoped practically to the floor of the level above. In going west at 106 feet a fault was met, pitching to the southwest; no belt has been found west of the fault. The level east, on No. 1 belt, has been extended 87 feet, and a crosscut has been driven north 63 feet and south 37 feet. Several small leads have been cut in this crosscut, including the Minnie Miller. No paying ore was found."

A great deal of work has been done at different times by open-cut on a plicated slate belt in which a great many corrugated quartz veinlets were found. Owing to the cheapness of quarrying a large quantity of slate was crushed giving satisfactory returns. Careful sampling of such a body would doubtless result in more remunerative operations.

The production is included with that of Caribou.

MOUNT UNIACKE[1]

Location

Mount Uniacke gold district is situated in Hants county, 3 miles north of Mount Uniacke, a station on the Dominion Atlantic railway. It is situated on the ridge that separates the waters flowing into the Atlantic ocean from those flowing into the bay of Fundy, the elevation of the highest point of the district being 550 feet.

Geology

The strata[2] form a closely folded anticline having a general course north 81 degrees east (magnetic) and continuing eastward through Renfrew district, 17 miles distant. The strata on the north limb dip north at an angle of 60 degrees and on the south limb vertically; whereas the anticline plunges to the east at a rather high angle and to the west at a low angle forming a dome of which the centre lies in a swamp on area 712. On the south limb of this dome a subordinate bulge or flexure in the strata radiates from the centre and extends south for a distance of 3,000 feet. On this undulation the outcrops of the strata form pronounced curves, but assume a comparatively straight course on each side towards the east and west. This subordinate flexure is of considerable importance as affording fissures along the stratification planes favourable for the deposition of ore.

The horizon of the strata exposed on this anticline is estimated to be 12,500 feet below the base of the Halifax formation. There is in this district a greater thickness of continuous quartzite than in any other district. A short distance south of the Nuggety lead is a 230-foot belt of quartzite free from slate, and a short distance farther south is a 420-foot belt of quartzite with only a few thin beds of slate. In[3] a section made in block XII by August Michel in 1869 a 380-foot belt of quartzite was found.

There are several more or less important faults. In the western part of the district a left-hand fault, giving a horizontal displacement of 1,085 feet to the anticline at the head of Coxcomb lake, runs north and south through Coxcomb lake and separates the main productive part of the district from the western part containing the group of veins and belts uncovered by Mr. Michel. A series of five small faults affects the continuity of the Borden, Little, Nuggety, West Lake, and Polkinghorn leads on the Prince of Wales and West Lake properties. Another line of disturbance, probably running north and south, occurs 800 feet west of the undulation on the south limb and twists the strata 80 feet to the north on the western side. The Nuggety, McPhail, Bunker, and South leads are also cut by two faults running northwest on the secondary undulations of the south limb. In the eastern end of the district are two left-hand faults in the vicinity of Alpha brook. The eastern one runs south 51 degrees east (magnetic), crosses Alpha brook directly east of Alpha lead and the main road 400 feet west of Alpha brook, and gives a horizontal displacement of 200 feet at the anticline. The other runs probably south 27 degrees east (magnetic) and gives a displacement of 40 feet on the Nuggety lead, between two shafts 130 and 150 feet deep on the eastern pay-streak, worked on the P. C. F. property.

Character of the Deposit

All the veins developed in this district belong to the interbedded class and are found on the south limb of the anticline. A few veins have been uncovered on the north limb, but none has been worked and that part of the district does not offer a very promising field for prospecting as the drift covering it has not been found auriferous.

---

[1] Plan published.

[2] Faribault, E. R.: Geol. Surv., Canada, vol. XII, pt. A, p. 175.

[3] Hind, H. Y.: "Report on Mount Uniacke, Oldham, and Renfrew Mining District," p. 77.

There are two well-defined zones of veins, one running south from the centre of the dome a distance of 3,000 feet and following the course of the secondary undulation on the south limb, and the other extending east and west nearly parallel to the anticline at a distance of 600 feet south of it at the west and 800 feet at the east. This zone is narrow, but has a total length of 6,500 feet or more extending from Alpha brook to about area 813, block 1. It is a zone of small crumples and rolls and includes many of the most productive veins of the district, such as the Nuggety, South, Bunker, Prince of Wales, West Lake, and Borden.

A few veins have been uncovered 4,400 feet east of Alpha brook immediately south of the anticline. At the western end of the district several veins have been exposed on the south side of the anticline between the West Lake property and Coxcomb lake on block 1; and beyond Coxcomb lake and west of the big fault a large number of veins were exposed by Michel on block 12 varying in width from 1 inch to 2 feet, many of which were found to be auriferous. All of those at the western end of the district were found north of the 380-foot belt of quartzite, which is undoubtedly a continuation of that occurring south of Nuggety lead.

On the undulation on the south limb one hundred and thirty distinct veins or belts of veins have been uncovered or operated to a greater or less extent, giving a total of 172 feet of quartz or crushing ore. Proceeding from area 678, block 2, southward, we cross the following most extensively worked veins:

Leads or belts	Thickness in inches	Distance from centre of dome in feet	Deepest works in feet	Length opened in feet	Remarks
Twenty-foot	240	100	Not worked	....	Holds mineralized streaks
Eight-foot	96	210	"		
Nichols	14	250	75	200	
Three-foot	34	275	Not worked		
Scotch belt	48	380	"	....	Cut by crosscut at 110-foot level
Number Three	10	400	260	400	Rich streak at 110-foot level, crosscut 180 feet south, and 100 feet north. At 150-foot level, crosscut 150 feet south
Cook	10-96	420	110	800	
Cross Tunnel belt	18	438	160		
1st P. C. F. slate belt	120	450	150	400	Belt 18 feet wide; rich streak, 10 feet, ore dips east angle 25 degrees
Murray	6	470	160	600	
Cut Lead belt	12	500	135	400	Rich streak on Cut lead
2nd P. C. F. slate belt	60	510	50	300	Belt 18 feet wide, 5 leads, shoots dip east
		545	....	....	Line between P. C. F. and the Montreal properties
Logan	8	600	100	300	
1st Montreal slate belt	120	622	65	85	Belt 20 feet wide; rich streak; 10 feet ore; dips east
2nd Montreal slate belt	100	660	80	80	Belt 16 feet wide; rich streak; 9 feet ore; dips east
Contract	4	710	105	1,000	With other leads was also worked in open-cut 25 feet wide and 15 feet deep
		875	....	....	From 710 to 875 several leads worked by shallow cuts
South	3	875	65	1,500	This and the next two leads constitute the east and west zone
Bunker	4	890	200	3,400	Worked to shallow depths for a great length
Nuggety	4	1,000	247	6,000	Four streaks worked 150, 247, 200, and 110 feet deep
McPhail	4	1,070	140	600	Shoot dips east

Leads or belts	Thickness in inches	Distance from centre of dome in feet	Deepest works in feet	Length opened in feet	Remarks
Iron slate belt	72	1,115	40	400	Between 1,115 and 1,380 feet band of coarse quartzite with several whin-bound veins of no value; no slate
		1,380	....	....	
Bain	6-24	1,405	140	1,000	Affected by four faults at east end
Allen belt	15	1,440	50	400	Two leads, 6 and 9 inches in the belt
		1,870	....	....	Between 1,440 and 1,870 feet coarse quartzite; several veins of no value, only one worked 45 feet; no slate
Howe belt	60	1,870	40	50	Belt 6 feet wide, short streak dips east, 3 feet ore
Dimock belt	72	1,885	240	400	Belt gives 14 feet ore on a rich streak (half crushing material) dipping east
Robertson belt	33	1,900	240	400	Belt of three leads, 3, 24, and 6 inches wide, on a rich streak dipping east and worked with the above belt for a length of 400 feet from the surface
		1,960	....	....	Between 1,900 and 1,960 feet ten leads cut by crosscut, averaging 12 inches not worked
Hayes belt	36	2,155	80	100	Belt of three leads
McQuarry belt	60	2,175	40	150	Large belt
Galena	6	2,235	50	200	
N. McIntosh	3	2,555	80	250	
Dowell belt	12	2,600	40		
S. McIntosh	6	2,640	60	....	Belt of three leads
Dimock So. belt	9	2,660	60	500	Belt of three leads
Toronto	4	2,925	55	100	
Haye slate belt	8	3,000	25	100	Workings farthest south

In this north and south zone of enrichment the pay-shoots dip to the east at angles varying from 25 degrees to 35 degrees. In the long zone extending east and west it is also found that the pay-shoots dip to the east. The South lead, 3 inches thick, and the Bunker lead, 4 inches thick, have been worked at intervals by many small shafts, seldom reaching 60 feet, and by open-cuts for a length of 3,400 feet. One pay-shoot on the Bunker lead, dipping east and formed by angular veins dipping southeast, has been worked on the Prince of Wales property to a depth of 200 feet. The Nuggety lead was uncovered for 6,000 feet and four important pay-shoots have been worked; one at the east end of the P. C. F. property, dipping east at an angle of about 35 degrees, was worked 150 feet deep; 1,000 feet west of it another, dipping east at an angle of 26 degrees, was worked to the eastern limit of Mr. Henry Hogan's Montreal property, proved very rich to a depth of 247 feet, and is said to still carry good ore; 2,700 feet farther west, a rich streak, probably dipping west, was worked to a depth of 200 feet; and, 1,100 feet still farther west, the last pay-shoot dipping east at an angle of 24 degrees was worked in connexion with some other leads on the West Lake property to the vertical depth of 110 feet and found very rich.

In the western part of the district on this last-named property the pay-shoots are determined by a secondary crumple lying 650 feet south of the main anticline. The axial plane of this crumple dips to the north, causing an enrichment in the leads where it crosses them. The rich shoots worked on the West Lake, Nuggety, Little, and Borden leads occur where they are folded in this subordinate crumple, the leads here becoming thickened and the quartz occurring in rolls. The crumple on the Borden lead plunges east at an angle of 18 degrees. As the axial plane of the crumple dips to the north the

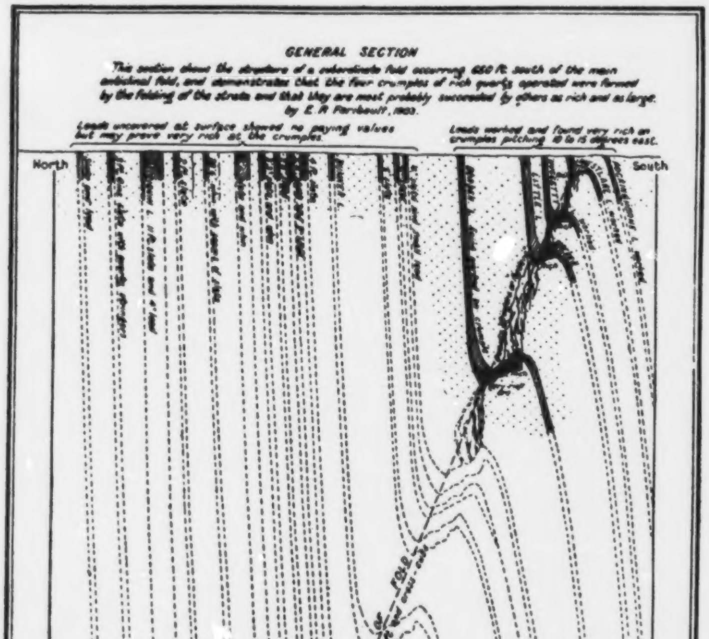
GENERAL SECTION
This section shows the structure of a subordinate fold occurring 650 ft. south of the main anticlinal fold, and demonstrates that the four crumples of rich quartz operated were formed by the folding of the strata and that they are most probably succeeded by others as rich and as large.
by E. R. Faribault, 1903.
Leads uncovered at surface showed no paying values but may prove very rich at the crumples.
Leads worked and found very rich on crumples pitching 10 to 15 degrees east.
North
South
AXIS OF FOLD
Index
Whin
Slate
Quartz
Scale of feet
10 5 0 10 20 30 40 50 60 70 80 90 100

Figure 4. Transverse section of West Lake mine, Mount Uniacke.

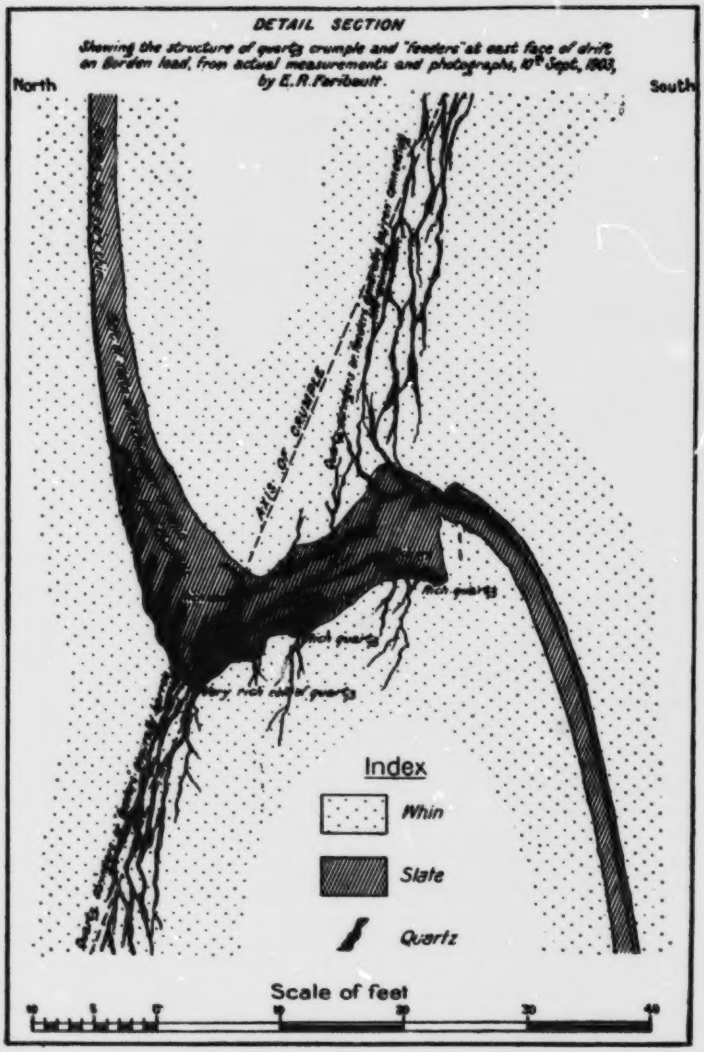
DETAIL SECTION
Showing the structure of quartz crumple and "feeders" at east face of drift on Borden lead, from actual measurements and photographs, 10th Sept., 1903, by E. R. Faribault.
North
South
AXIS OF CRUMPLE
rich quartz
rich quartz
very rich cake of quartz
Index
Whin
Slate
Quartz
Scale of feet
10
5
0
10
20
30
40

Figure 5. Transverse section in detail of a part of West Lake mine, Mount Uniacke.

rich shoot of each successive vein is found to the north of, and at a greater depth than, that of the vein immediately south. Numerous quartz stringers pass upward from the apex of the crumple of one vein to the trough of the crumple of the next vein to the south, and, although these stringers are generally barren themselves, they seem to serve as feeders to the vein above and cause an enrichment at the lines of intersection. The[1] production of gold from the West Lake and Nuggety crumples is 1,142 ounces from 1,472 tons crushed, and from the Borden crumple 2,991 ounces from 2,121 tons crushed.

History

A discovery[2] of auriferous quartz veins was made in this district on the farm of the Hon. Richard J. Uniacke by Messrs. David Mackintosh, John Sims, and Charles Sims, on June 18, 1865. Many licences were taken out and the prospect was so promising that before the middle of 1866 more land was held in this district under leases and prospecting licences than in any other in the province. In 1866, a small crusher was erected and a road was built from Uniacke station to the crusher. The following year this road was improved and extended, two more crushers were erected, and such a rapid growth took place in the mining industry that, while the production for 1866 was reported as 72 ounces, that for 1867 was reported as 1,622 ounces. In December, 1866, there were only two houses on the field, but a year later there were more than fifty, and over two hundred residents. Prospecting was easy on account of the thin covering of drift, but this rapid growth was ascribed by some to 'secret influences, and partly reported crushings.'

A number of men and companies were at work here in 1867, but the exact location of their workings is difficult to ascertain, as the early reports of the Department of Mines, Nova Scotia, make no mention of the names of the veins. During this year a Mr. Mitchell sank two shafts 35 feet apart on one lode. West of him Mr. Burkner sank two 25-foot shafts on another lode and commenced stoping; and still farther west and on the same lode as Mr. Burkner was working, a 50-foot shaft was sunk by Mr. Doull and stopes carried along the vein on each side. The Montreal Company worked the Logan lode by two shafts and the Mount Uniacke Company sank three shafts on a lode to the east of the Logan lode, besides opening two lodes farther south. Some distance to the west of these operations Messrs. Hall and McAllister opened a 10-inch lode by two shafts, 50 feet and 35 feet deep, and still farther west the West Lake Company mined a lode, or rather an aggregation of lodes, the width of which was about 9 feet.

The year 1868 saw a rapid increase in operations and the production reached the high-water mark for this district—3,247 ounces. Most of the numerous companies engaged during the preceding year continued operations this year and their number was increased by several additional companies. The veins worked by these companies are not known exactly, but the areas held, together with the returns to the Mines Office and the dates of these returns, are recorded in Hind's Report on Mount Uniacke Gold District. The Mount Uniacke Company continued work, and the main shaft reached a depth of 190 feet, and others were 150 feet deep. Driving levels, stoping, and crosscutting were done. The Montreal Company, who held a property extending from areas 615, 616, and 617 east to areas 813, 814, and 815 inclusive, block 2, opened a lode 47 feet south of the Logan lode and another 7 feet still farther south, sinking and stoping on both, and directly to the west the Uniacke Company sank shafts on a 6-inch lode. The Prince of Wales Company, whose property lay next to the westward, did some work on a 5½-inch lode; and still farther west the Queen Company opened four shafts on each of two lodes lying in a range of areas, including and extending westward from areas 219, 220, and 221. One of these lodes had been opened the preceding year by Messrs. Hall and McAllister. The West Lake Company opened its vein by three shafts, the deepest being upwards of 50 feet, and these were connected by a tunnel from which the lode was stoped to about 6 feet from the surface. The Imperial Company did a little work on some areas farther west than the West Lake Company's property in block 1, and Messrs. McNab and Company sank a shaft on a lode about 200 feet north of the West Lake lode, and at a depth of 44 feet some crosscutting was done. Some work was done on two veins by the Brunswick Company, who held a portion of land of which the corner areas were 213, 218, 345, and 356, block 2, and work was continued by the Union Company on the lode opened by Mr. Doull south of the Central Company's property. Mr. Burkner continued operations this year, and the St. Lawrence Gold Mining Company and D. Touquoy also reported a small amount of gold.

---

[1] Faribault, E. R.: Geol. Surv., Canada, vol. XV, pt. A, p. 182.

[2] Heatherington, A.: "Guide to the Gold Fields of Nova Scotia", p. 68.

The year 1869 saw a marked decrease in mining activity which reflected itself in the production. The production rapidly decreased year after year until in 1874 only 14 ounces were reported. The probable cause for this is given in the Report of the Chief Commissioner of Mines for 1870 in which he says: "There has, perhaps, been no district so much injured by the speculating mania of 1867 and 1868 as this one. Properties that were of moderate size were cut up into two or three, and sold to speculators. In some cases crushers were built, not with the expectation of mining, but to sell stock. The result has been litigation, disappointment in making sales, and stoppage of the works."

In 1869, the Mount Uniacke Company continued operations with profit to the owners; the main shaft was continued to a depth of 230 feet, and a crosscut, driven 135 feet on the 110-foot level, intersected several veins. The other companies that made the most important returns for the year were the Montreal Company, the Central Company, and the Queen Company; the work of others in this district was chiefly of an exploratory nature.

In 1870 the Uniacke Company was the only one that kept continuously at work, reporting 501 ounces of the total production of 566 ounces. The Queen Company took out a little quartz and the West Lake mine was reopened. In 1871, the Uniacke, the Montreal, the West Lake, and the Queen properties were worked on a small scale, and the next year a few tributers removed some easily accessible quartz from various properties. In 1873 and 1874, tributers did a little work, and in the latter year the production fell to 14 ounces.

After this the production steadily increased until in 1882 it reached 1,786 ounces. In 1875, the miners living in the district worked the outcrop of the leads on the property of the Montreal Mining Association, chiefly on the area 682, block 2; the principal work in the latter part of the year was done on area 678 by the Uniacke Gold Mining Company under the management of Mr. Prince. In 1876 the greater part of the gold obtained was reported by Messrs. Hogan and Barsalou from area 780, block 2. This year Mr. McClure resumed operations on a vein intersected by the 150-foot crosscut on the property of the Montreal Mining Association. New machinery was put in and the mill was repaired, but he was unable to make the mine on area 614 pay working expenses and reluctantly abandoned sinking in 1877. During this year several tributers were at work, but the most promising discovery was made on the Toronto property, area 755 (?), where a 3-inch lead was opened, which yielded 4 ounces per ton.

In 1878 the most successful mining was done by Mr. McIntosh on area 717, and the Montreal, the Queen, and the Prince of Wales properties received some attention. In 1879 the Nugget and South lodes were worked and various tributers carried on operations on other lodes. In 1880, the Bunker, Mitchell, and McPhail lodes were worked on the Montreal areas by stoping from the shafts and by open-cuts, and the West Lake property was also worked. In 1881 there was increased activity. The Nugget lode was worked by Mr. Blois, and Messrs. Davidson, Herbin, and others were engaged on its eastern extension. Mr. Prince continued working the slate belt on the Uniacke property; the West Lake property was worked by Messrs. Bayne and others, and the Bunker lode on the Prince of Wales property by Mr. Foster, who carried a light 5-stamp mill.

In 1882, the Nuggety lode was worked by Mr. Blois and Mr. Prince, the latter of whom resumed operations on the slate belt towards the close of the year. The large slate belt on the Montreal property was reopened and extensively worked; the Galena lode was worked by Mr. Lee; and Mr. Davidson sank a 200-foot shaft on a 12-inch lode. In 1883 Mr. Davidson continued his work; Mr. Blois worked for some time near the pond and later turned his attention to the slate belt on the Montreal property; Mr. Prince worked the Uniacke property and reopened the eastern extension of the Nuggety lead, and Messrs. Madill and Brown also carried on limited operations. The next year Messrs. Davidson and Prince continued operations, and some tribute work was also done on the Montreal, Union, and other areas. The year

1885 saw Messrs. Davidson and Prince still at work. The production of 1886 fell to 320 ounces and that of 1887 to 107 ounces. In the latter year several properties were bought up by the British and Colonial Land Association and preparations were made for carrying on extensive work on low-grade ore by the erection of a 20-stamp mill, Frue vanners, and a power plant. Little seems to have been done, for in 1888 the production of this district was again very low and in fact it has seldom risen to any important figure since then.

In 1889, the Phoenix Land and Development Company, Limited, was incorporated, and under the management of H. B. Prince some sinking was done, and in 1891 the shaft had reached a depth of 230 feet on a belt of low-grade ore. In 1891, the Messrs. McCallum made a rich strike near the old Alpha property and ore was taken out, which was crushed at the Phoenix mill. Interest was also revived in the West Lake property and it was worked a while. In 1892, the C. P. F. Mining Association was formed to acquire the property of the British and Colonial Land Association, and work was started by open-cut on a low-grade belt, and continued for several years. In 1896, F. R. Prince was manager, and sixteen men were employed on a belt that furnished 16 feet of milling ore, yielding about 2 hundredweight per ton. The ore was crushed at a 10-stamp mill. In 1897, however, nothing more than a little tribute work was carried on in this district.

In 1901, this district was once more the scene of activity. The National Mining Company—John Kenty, manager—had eighteen men employed on the Prince of Wales lead which they had reopened in July, 1900. The Queen lead, 123 feet south of the Prince of Wales lead, was also reopened and a 2-stamp Tremain crusher was used for testing. In 1901 this company returned 266 ounces of gold, and in 1902, 79 ounces. In 1901 the Great Belt Mining Company was organized to reopen the old quarry works on the property known as the British American. The large open-cut is divided into two parts by a belt of whin several feet thick and operations were resumed in the north division which is about 30 feet wide, the north half of which is a 15-foot slate belt intercalated with small quartz veins. In 1902, under the management of T. Prince, the open-cut had reached a depth of 120 feet and a length of 80 feet, and the ore was crushed at a 30-stamp mill which had just been completed. This company reported a production of 254 ounces from 3,095 tons in 1902, and 35 ounces from 300 tons in 1903.

On July 1, 1902, work was started on what was supposed to be the Nuggety lead on J. A. Johnson's property several hundred feet east of the West Lake mine, and in the same year the Royal Mining Company did some sinking on a slate belt thought to be the Chittick belt on some areas north of Johnson's. In 1903 the work on Johnson's property was managed by Geo. E. Johnson, who had four men sinking. This sinking continued during 1904 and 1905, under the management of G. Johnson, with the expectation of cutting a crumple similar to that found in the Borden lead on the West Lake property. At a depth of 200 feet a small roll was intersected and driven on for a few feet east. In 1905 the shaft was 400 feet deep and crosscutting above that depth was started northward.

By far the most important operations in this district in recent years were those on the old West Lake property in which Messrs. Archibald and Crease were interested. The work consisted chiefly of mining and milling the rich pay-shoot that followed the crumple of the Borden lode. A crumple on the West Lake lead was mined with great profit in 1868, and later some sinking was done on the Borden lead, but this was abandoned before the rich ore was struck. This lead was reopened in 1901 under the management of J. Bryson, and 606 ounces of gold was extracted from 587 tons of ore. Work was steadily carried on in 1902 under the management of D. Patriquin, the pay-shoot being followed and the ore crushed at the old Madill 8-stamp mill. The production reached its maximum this year, being 1,659 ounces from 703 tons. In 1903, J. A. Crease had eleven men employed, and in 1904 Mr. Crease was still manager. This year the shaft was sunk 65 feet deeper and a crosscut driven north 15 feet with the expectation of finding crumples on other veins lying to the north of the Borden. Only two small stringers were cut, however. In the autumn of this year the plant was destroyed by fire, but was rebuilt; and in May of the following year the new plant was also destroyed by fire, apparently of incendiary origin. In 1905 the workings were abandoned.

In 1906, J. A. Crease had five men employed on what is known as the Whinbound lode, and in 1907 and 1908 he made returns to the Mines Office. In 1908 returns were also made by J. A. Johnson.

A small amount of work was done during 1916, 1917, and 1918 on the Borden and Nuggety leads and the Bunker belt. The Borden main shaft was unwatered and a small amount of stoping done; a shaft was sunk on the Nuggety lead to a depth of 58 feet and a crosscut driven 28 feet north to the Polkerhorn lead; and a shaft was sunk to a depth of 98 feet on the Bunker belt. The Hayes lead in the southern part of the district was worked in 1919, 1920, and 1921 by W. P. C. Inglis and others. The lead is 6 inches wide and a rich streak was found dipping east at an angle of 30 degrees above a 14-inch roll. Two shafts 20 feet and 90 feet deep and 45 feet apart were sunk, the ore between the shafts was stoped, and the rich streak was followed 20 feet east of the main shaft. At a depth of 90 feet a crosscut was driven north cutting the Toronto lead at 50 feet and the Gray lead at 60 feet. The workings were not deep enough to cut the pay-shoot of the Toronto lead. Some work was done in 1923 on the Toronto lead and at a depth of 50 feet in a shaft sunk a few years previously a crosscut was driven north 10 feet to the Gray lead. At the crosscut the Gray lead was found to be small, but 6 feet deeper there were two leads of 1 inch and 2½ inches showing gold. The Montreal Development Company did some work on its property in 1917, 1918, 1922, and 1923, mainly on the Nuggety lead. In 1918 a yield of 20 ounces was obtained from 190 tons of ore and in 1922 a production of 57 ounces from 108 tons. In recent years a small amount of work has been done by J. A. Crease and others, and in 1928 operations were conducted on a small scale by W. P. C. Inglis on the Toronto and neighbouring leads.

General Development

Regarding the extent to which operations have been conducted on the different leads, the reader is referred to the published plan and to the paragraph on "Character of the Deposits," where the depth of the workings is given. This is one of the districts in which an attempt was made to mine low-grade deposits by open-cut, and a great proportion of the rock and quartz of some large belts was milled. The large belts of mineralized slate and quartz which have been operated on the P. C. F., the Montreal, and the Phoenix properties have been found to carry regular values on the north and south zone of enrichment, and they still present a very promising field for extensive mining of low-grade ore.

In no part of the district has mining been carried to any great depth, and it seems probable that in many cases the workings have not been carried to the bottoms of the pay-shoots. It also seems probable that in zones of special enrichment other pay-shoots parallel with those already worked and underlying them occur either in the same vein or in adjacent veins. The crumple already described as cutting the West Lake, Little Nuggety, and Borden veins probably extends to greater depth and produces rolls in other veins farther north that might be worth exploring.

Production

(Including Mount Uniacke and South Uniacke)

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1867	947	1	17	1,212		15	15
1868	3,995	12	5	4,659		17	4
1869	1,867	3	12	3,171		11	18
1870	566	14	5	1,794		6	7
1871	360	17	3	900		8	0
1872	241	10	0	364		13	7
1873	129	8	18	198		13	1
1874	14	1	0	19		14	19
1875	139	3	3	319		8	17
1876	227	14	10	321		14	4
1877	663	15	9	470	1	8	6
1878	629	5	7	704		17	21
1879	787	18	0	744	1	1	4
1880	1,161	16	12	1,505		15	10
1881	1,355	8	21	3,094		8	23
1882	1,786	4	9	3,440		10	12
1883	1,197	15	0	2,809		8	12
1884	1,140	6	2	2,235		10	4
1885	576	0	12	2,010		5	7
1886	320	17	3	1,263		5	3
1887	107	3	1	689		3	2
1888	632	7	1	612	1	0	16
1889	1,390	11	9	2,296		12	2
1890	1,612	2	13	2,525		12	18
1891	2,965	5	4	1,751	1	13	20
1892	2,300	0	14	786	2	18	12
1893 (9 mos. ending Sept. 20)	905	11	5	644	1	8	12
1894 (year ending Sept. 30)	1,394	8	1	1,544		18	1
1895	2,535	13	13	3,516		14	10
1896	3,732	0	15	5,092		14	16
1897	2,274	9	4	2,349		19	9
1898	1,779	6	23	1,899		18	17
1899	984	17	0	1,770		11	3
1901	874	9	0	748	1	3	9
1902	1,992	19	23	3,896		10	6
1903	893	2	22	1,390		12	20
1904	975	19	18	2,349		8	7
1905	99	11	15	38	2	12	10
1906	246	11	15	161	1	10	15
1907	143	15	0	25		15	0
1908	21	19	4	22		19	23
1908	53	8	15	(Mortared)			
1910	41	17	23	90		9	7
1910	36	16	0	62		11	21
1911		2	0	10		0	5
1912		2	0	10		0	5
1918	20	2	2	190		2	13
1919	5	5	5	10		10	12
1920	40	7	0	20	2	0	8
1922	57	2	20	108		10	13
1923	76	5	15	155		9	20
1925	8	1	0	32		5	0
1926	1	1	0	8		2	15
	46,311	9	20	66,029			

OLDHAM[1]

Location

Oldham[2] gold district is situated in the northern part of Halifax county about 25 miles north of the city of Halifax and 3 miles east of Enfield, a small station on the Canadian National railway.

Geology

The district lies near the summit of the watershed that separates the streams flowing into the Atlantic through Porter lake from those whose waters reach the bay of Fundy by Shubenacadie valley. The elevation of the centre of the district is 317 feet. The Goldenville formation is exposed in a subordinate anticline 9 miles long lying on the south limb of the Shubenacadie-Grand Lake anticline. The intervening syncline lies half a mile north of the Oldham anticline. The fold, which follows a ridge, is transversely symmetrical and the strata dip in both directions at angles varying from 50 degrees to 80 degrees. The fold plunges to the east at angles increasing to 45 degrees, and 3 miles east of the district flattens out and disappears; it plunges to the west at an angle great enough to completely conceal the Goldenville formation by the Halifax formation at the railway bridge on the inlet of Shubenacadie-Grand lake.

The dome has suffered much faulting, especially in the eastern part. An important fault follows the axis of the anticline, and attempts to trace veins around the apex of the dome past this fault have met with poor success. Radiating from the dome towards the southeast is a series of important right-hand faults, two of which have horizontal displacements of 112 and 124 feet. On the north limb are a few small breaks. A few flat faults have been met in underground workings. Most of the faulting has been later than the formation of the veins, but the Baker vein of the eastern part of the district occupies a fault plane.

Character of the Deposits

The most productive part of the district is the eastern end of the dome, that part that has suffered most from faulting. Nearly all the productive veins are of the interbedded type, although the Baker vein in the east and the Britannia vein on the north limb, both of which proved highly auriferous, are cross veins. Among the most important interbedded veins may be mentioned the Dunbrack, Sterling, Boston-Oldham, North Wallace, South Wallace, and Donaldson; great numbers of others have been worked and many of them with profit.

The pay-shoots follow the rolls, which are quite prominent in the veins in the southeastern part of the district and dip to the east. A rich shoot on the Sterling Barrel lead was mined to a depth of 1,900 feet on an incline increasing from 30 degrees at the surface to 43 degrees with depth. The ore-shoot was worked for a width of 100 to 150 feet to a fault at the north. The vein is corrugated, lies on the lower side of a bed of slate, and is in many places frozen to the foot-wall of quartzite into which the corrugations sink. A tunnel driven from the 700-foot level on the Sterling Barrel lead east and west along the fault plane to which the workings had been carried on the north, cut at a point 412 feet to the east a lead on the north side of the fault supposed to be the Sterling Barrel lead. The vein is corrugated, is 6 inches wide, and lies between massive beds of quartzite carrying disseminated mispickel. There is a concentration of almost solid mispickel 4 inches wide on the upper side of the vein.

On the Dunbrack lead two well-defined parallel shoots pitching east at a lower angle than the corrugation were worked, the upper one, the Ned McDonnell, for a length of 850 feet, and the lower one, the Hardman, for a length of 1,200 feet. The shoots are cut off by a fault on the north. The Ned McDonnell shoot was 8 inches thick and the Hardman shoot 8 inches to 22 inches thick. The Hardman shoot was enriched by angulars from the foot-wall and the richest ore carried galena and zinc blende.

---

[1] Plan in pocket.

[2] Faribault, E. R.: Geol. Surv., Canada, Sum. Rept. 1912, pp. 379-382 (1914).
Wilson, M. E.: Geol. Surv., Canada, Sum. Rept. 1926, pt. C, pp. 89-90 (1927).

In the northeastern part of the dome a number of veins such as the Boston-Oldham and Frankfort proved rich on their curve towards the apex of the anticline. Some veins have been worked extensively on the strike. Some leads north of the centre of the dome were enriched at the intersection of angulars from the southwest. In the Blackie vein the gold was concentrated in arsenopyrite pockets, some of which carried as much as 5 to 7 ounces of the precious metal. Other veins in the southwestern part of the district have proved productive.

History

This is one of the oldest districts in the province, and one in which the production has been very steady; for in only one year, 1896, did the yield fall so low as to be included by the Department of Mines, N.S., under the heading "Other Districts." This is due to a certain extent to the large amount of tributing that has been done here.

"In[1] the spring of 1861, when public attention throughout the province was excited by the confirmation of the report of the discovery of gold at Tangier, two men, Edward Horne, of Elmsdale, and Samuel Isner, of Gays river, who had in their hunting excursions observed a large boulder of white quartz in a densely wooded tract, about 3 miles east from the Truro road, determined to examine it, for the purpose of ascertaining whether it contained gold." They succeeded in finding some small sights, and on their discovery being confirmed and made public several persons commenced prospecting in the vicinity. Amos Hough found gold about September 1 in a brook 1½ miles southwest from Horne and Isner's find, and a mile east of Hough's a discovery was made by Edward McDonald and Donald McKensie, who brought the matter to the attention of the government. The free claim was awarded to Horne and Isner.

Considerable prospecting followed and in 1862 a number of leads were opened and active mining operations commenced. On the Barrel lead running through area 314 a shaft was sunk 80 feet deep. Increased activity was noticeable in 1863, additional areas were taken up, and five new stamp mills were erected, making a total of eight mills in the district. This activity continued through the following year and 1,750 ounces of gold was reported, one small lot of quartz giving the phenomenal yield of 103 ounces per ton.

This period of activity was succeeded by several years of comparative depression, the yield for that decade reaching its lowest level in 1868, when it fell to 719 ounces. In 1866 and 1867 the principal mining in the district was done by the Boston and Oldham Company, but in June of the latter year this company ceased operations. They did some work in the barrel-quartz section and on a lode farther north sank shafts and did some stoping. In 1866, a Mr. Lockhart did some work in the district. In 1867, Mr. Schaffer started work and was the chief operator in 1868. He did some work on the Britannia lode, but his activities were confined chiefly to mining barrel quartz. In 1868, Mr. Bunker sank three shafts near Schaffer's property, and old workings on the Ohio lode were reopened by Messrs. Fraser and McBean. The same lode was opened a little farther west by Mr. Donaldson. Mr. Donaldson continued operations during the following year, but Messrs. Fraser and McBean closed down.

The year 1869 saw a renewal of activities in this district, and many old workings were reopened. Some exploratory work was done by Messrs. Oakes, Pearson, Bayne, Woodruffe, and others. The Ritchie lead was reopened by Captain Coxetter, and Messrs. McDonald and Schaffer worked a lode, containing barrel quartz and lying to the east of the Barrel lode, which Mr. Schaffer had previously worked. The principal operations, however, were carried on by the Sterling Company, which had acquired several abandoned properties, and sinking and stoping were conducted on the Barrel lode on which Mr. Schaffer had worked, and on the Frankfort, Wallace, and Ritchie leads. This company continued to be in 1870 the principal operator, working the Barrel, Frankfort, and Blue lodes, and continuing on the Barrel lode in 1871. A new shaft was sunk, and crosscuts were driven, cutting in addition to others, the Sutherland and Harrison lodes. Next to the Sterling Company the St. Andrew's Company was the most important and it reopened the Symonds lode which had been worked formerly by the Boston and Oldham Company, and worked it until late in 1871, when it was closed. Besides these Mr. Donaldson and a few others did a little work. This year, 1870, there were three crushers in operation, two driven by waterpower and owned, one by Robt. G. Fraser, and the other by the Oldham Company; the third was driven by steam and owned by the Sterling Company.

---

[1] Rept. Chief Gold Commissioner, 1862, p. 17.

Except for the St. Andrew's and the Sterling Companies the principal returns for 1871 were made by Doyle and Horne and R. G. Fraser. This year Mr. Schaffer started work on the Britannia lead, but on striking a fault and failing to pick up the lead in a 30-foot crosscut, he directed his energies to the McKenzie lead, which he pumped out by power from the Napier mill. In 1873 he did a little work on the Ritchie lead.

Mr. Donaldson continued to work in 1871 the lead he had opened and he remained an active operator here until 1876, when his mine on areas 130 and 131 was transferred to Mr. McClure.

The Hall lead on the Sterling property was worked a little in 1873 and steadily in 1874, during which year some little work was done on the Whitehead, Britannia, and Blue leads.

More men were at work in this district in 1875. The principal work was done by Mr. Donaldson on areas 130 and 131, and by Mr. E. McDonald on areas 322 and 323. The Hall lead was worked in the early part of the year by Mr. Schaffer, and later by Mr. McAllister and others. The Frankfort lead was reopened in June by Messrs. A. McDonald and Company, and the Dunbrack and Barrel leads were also reopened.

In 1876, the Donaldson property, known as the Bonanza, on areas 130 and 131, was transferred to Mr. McClure and work was resumed in the autumn after much money had been spent in making alterations and repairs. Unfortunately the mine had to be abandoned the following summer. In 1876 further attention was given to the Angling lead, area 533; and the Wallace, areas 337, 339, and 341, and the Frankfort, areas 321 and 322, were mined. The Blackie was worked this year and in the spring of 1877. Tributers worked in 1877 on the Hall lead and on the Angling leads of the McKenzie and Sterling properties; a shaft was sunk on the Blue to test its intersection with the Britannia, and the Hay or Nugget was worked to a depth of 80 feet. In 1874 a 60-ounce pocket of gold was found in the last lead, but the rest of the quartz was almost barren. The production of this year was greatly increased by T. N. Baker's discovery of a very rich lead on areas 627 and 628, from which 1,280 ounces were taken in 5 months.

Mr. Baker erected an 8-stamp mill and work on this important lode was carried on until 1881, when operations ceased and some new lodes were prospected.

A rich spot was struck on the Britannia lode in 1878, but the next year Mr. Donaldson discontinued his work there and turned his attention to the Hall lode. In 1879 some work was done on the Frankfort and Wallace lodes. In 1880, Messrs. Doyle and McDonald worked an angular on the Sterling property and work was continued by the Messrs. Donaldson, who also opened a series of lodes a short distance south of the Mayflower mill in 1881. This property was worked the next two years. In 1882, Mr. Baker opened a large cross vein and worked it during this and the following year, and during these two years some tribute work was done on different properties, but interest in the district seems to have flagged and the production fell to a very low ebb, especially in 1881 and 1882, when 329 ounces and 411 ounces respectively were extracted.

In 1884, A. McDonald sank a 100-foot shaft on a barrel lode near the Sterling property and stoped out a portion of it; some tribute work was done by many, among whom was E. C. McDonnell, who continued his shaft the next year to a depth of 200 feet and then closed down in the autumn to erect a steam power plant for more efficient pumping and hoisting.

In 1884, J. E. Hardman mined successfully a belt of low-grade ore and made preparations for mining the Fraser, Lowell, and Baker properties together and reopening the main shaft on the Baker lead. The next year he opened a rich lead west of Mr. McDonald and completed arrangements for pumping and hoisting at his main shaft by electric power generated a half mile distant by the waterpower by which his crusher was driven. The Dunbrack lode came in for a great deal of attention in 1886, being worked on different properties by J. E. Hardman, E. C. McDonald, and Messrs. Donaldson. Hardman did some sinking and drifting and obtained some good quartz; McDonald obtained ore from the bottom of his workings, yielding 3 ounces per ton, and sold out to Mr. Hardman the next year; the Messrs. Donaldson, who had done a little work the preceding year, extended their shaft to a depth of 95 feet.

Mr. Hardman worked the Mayflower and Dunbrack leads in 1887, and for several years continued to be the principal operator in the district. Mining was brisk and returns usually ran between 2,500 and 3,000 ounces. In 1890 the two leading companies were the Oldham Gold Company and the Standard Gold Company, the personnel of both of which consisted of J. E. Hardman, Oldham, N.S., and Frederick Taylor, Lowell, Mass. Operations were conducted on the Dunbrack lode by the Standard Gold Company and on the Baker and Dunbrack by the Oldham Gold Company. The latter company erected a new 10-stamp mill in 1891, at which the quartz from the mine of the Standard Gold Company was also crushed. These two companies and the Napier Mining Company, Limited, were all under the management of J. E. Hardman. In 1892 the Napier Company sank a vertical shaft 113 feet deep on the apex of the anticline on area 102, cutting seven lodes that do not outcrop at the surface. Two of these were said to be sufficiently auriferous to justify further development. At a length of 100 feet crosscuts were driven 100 feet each way and levels were started on different leads. In 1893 active mining was still carried on, this year under the management of W. J. McIntosh, and during the first nine months the official returns for the district were greater than for any other year in its history, being 3,171 ounces.

The[1] official returns from the mill of the Oldham Gold Company are as follows:

Year	Ore crushed	Yield
	Tons	Ounces
1885	925	1,700
1886	928	2,164
1887	2,359	2,560
1888	2,107	1,699
1889	1,393	2,705
1890	1,126	2,775
1891	1,789	2,447
1892	2,233	3,089
1893	2,334	3,292
1894	918	536

A comparison of these returns with those of the whole district will show that the Oldham Gold Company's mill was producing nearly all the gold of the district during these years. The[2] Dunbrack vein was, during these ten years, the most productive, and from it several phenomenal yields were recorded: in August, 1895, 125 ounces from 2·4 tons; in 1890, 1,037 ounces from 37 tons and 530 ounces from 12 tons; in 1891, 757½ ounces from 48 tons and 1,084 ounces from 88½ tons; and in August, 1893, 250 ounces from 2 tons. In July, 1895, work had ceased, and the production was low for several years.

In the early nineties two or three other companies erected stamp mills and carried on operations, among which may be mentioned the Concord Gold Mining Company and the Columbia Gold Mining Company, but little resulted from their work.

In 1899, H. F. Donaldson pumped out and retimbered the Bonanza mine and did some stoping. M. R. O'Shaughnessy had eleven men employed on the Blackie lead, and a number of men were prospecting and tributing in other parts of the district. Tributing continued during the following year. T. N. Donaldson and others reopened the Doran lead, southeast of Hardman's deep shaft, deepened the shaft, and did some stoping. Edward Whidden and Company, who had unwatered the Sterling lead in November, 1899, and retimbered it, sank the north shaft an additional 70 feet and stoped out some of the quartz.

In 1903, the Columbia property was reopened by L. E. Dalos for the New England Gold Mining Company. A crosscut driven 410 feet to the north intersected several leads, including the Wallace, North Wallace, Powell, and Worrell. Tributing has been carried on more or less intermittently on various leads, but the later history of the district is to a great extent centred in the operations at the old Sterling property.

---

[1] Can. Min. Man., 1895, p. 86.

[2] Mason, F. H.: Can. Min. Rev., vol. XIV, p. 154.

In 1903, the Oldham Sterling Gold Company, which had been organized the preceding year, was working on this property under the management of E. Whidden. The next year J. B. Forster took the management of the mine and continued operations until 1908, when the management passed into the hands of C. V. Brennan. Work was confined almost altogether to the Sterling lead, but some exploratory work was done in 1908 on the Blue and the Schaffer barrel leads. The main shaft on the Sterling lead had in 1908 reached a depth of 1,330 feet on the incline or 725 feet vertical depth, the first 500 feet of the incline being at an angle of about 30 degrees, below that running for some distance at about 38 degrees, and at the bottom 41 degrees. Crushing was done for some time at the Taylor-Hardman mill, but a new 10-stamp mill was erected in 1905. After three months' unsatisfactory crushing in this new mill in 1906, the ore was again sent to the former mill. Crushing was, however, resumed in the company's mill in June, 1908.

Work continued at this mine in 1909 under the management of W. A. Brennan. The inclined shaft was sunk 195 feet farther, so that it is now 1,525 feet deep on the incline. The dip at this depth is 43 degrees. In 1910 work was carried to a depth of 1,600 feet and levels were driven south at depths of 1,200 and 1,300 feet in search of other ore-shoots, and in 1911 an 80-foot shaft southwest of the main workings was opened and sunk 120 feet and at the bottom levels were driven east 60 feet and west 40 feet. A fault with a throw of 40 feet was encountered at a depth of 160 feet. In 1926 the Acadia Gold Mining Company unwatered the Sterling slope to the 700-foot level, picked up the lead north of the fault at a distance of 412 feet east in a tunnel driven along the fault, and stoped the lead north of the fault. Work was continued in 1927, the level on the north Sterling was driven to a length of 125 feet, and the vein was stoped. The tunnel which was driven 470 feet east and 630 feet west along the fault cut a number of leads. Short levels were driven from the tunnel on the north Logan belt and on the north Republican, and a level was driven 265 feet on the south Republican. Operations were continued in 1928 on the north Sterling lead and the south Republican.

The ore from the Sterling lead proved very rich, the production being as follows:

Year	Ore crushed	Yield
	Tons	Ounces
1904	214	498
1905	665	1,145½
1906	804	1,249
1907	362	853
1908	526	2,384
1909	940	2,710
1910	881	2,419

In 1909, the Oldham Mining Company—C. V. Brennan, manager—had twelve men employed on the Schaffer barrel lead. The shaft, which was originally 100 feet deep, was sunk 95 feet farther. From 224 tons of ore 204 ounces of gold was recovered. Work on this lead was continued in 1910. A number of tributers reported altogether 113 ounces of gold from 209 tons of ore.

In 1914 M. J. O'Brien unwatered the Dunbrack lead to the 450-foot level and sank a winze northeast of the 97-foot fault. In 1915 and 1916 considerable work was done on this lead by the Oldham Mining Company under the management of G. J. Partington in search of the extension of the Ned McDonnell and Hardman ore-shoots north of the fault. An ore-shoot thought to be the Ned McDonnell was struck and in 1915, 563 ounces of gold was recovered from 321 tons of ore. A winze followed the pitch of the shoot 35 degrees northeast and in 1916 was continued from a depth of 90 feet to a depth of 135 feet, 288 ounces of gold being recovered from 282 tons of ore. Fifty feet southwest of this winze another winze was carried to a depth of at least 210 feet in search of the Hardman shoot, but at that depth it had not been struck. In 1923 operations were conducted on a small scale on the Dunbrack lead on the Rhode Island property west of the Hardman property.

For a number of years John and Alex. Greenough worked the Broussard lead and the angular cutting it on the Big Five property in the western part of the district. In 1910, 433 ounces of gold was recovered from 284 tons of ore; in 1911, 125 ounces from 124 tons; in 1913, 112 ounces from 135 tons; and in 1914, 182 ounces from 385 tons.

General Development

Not much information along this line is available. The plan of this district was the first one that was made by Faribault, and the survey was undertaken to show the structure of the dome and not the extent of the mining operations.

The location and depths of very few shafts are given and we cannot, therefore, judge from the plan as to the extent to which operations were carried on.

In the early days of Oldham's history a great deal of mining by open-cut was carried on, and at the time of the publication of Hind's report on this district in 1872 open trenches exceeded 43,000 feet in length and the whole surface was honeycombed with trenches, shafts, and pits, few exceeding 60 feet in depth.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1862	51	0	0	84		12	3
1863	1,223	3	21	1,026	1	4	6
1864	1,362	15	8	1,757		15	12
1865	1,242	6	21	2,409		10	8
1866	776	12	4	964		16	3
1867	1,359	12	2	960	1	8	8
1868	911	7	5	1,235		14	18
1869	1,394	16	0	1,735		16	1
1870	2,051	15	3	2,644		15	12
1871	1,718	12	12	1,374	1	4	4
1872	1,014	11	10	793	1	5	14
1873	998	2	17	662	1	10	3
1874	665	8	11	527	1	5	6
1875	915	8	2	550	1	13	6
1876	1,953	5	23	1,705	1	2	21
1877	2,527	19	13	2,015	1	5	2
1878	1,737	9	9	1,808		19	5
1879	1,600	17	0	1,787		17	22
1880	829	4	17	1,475		11	5
1881	329	10	4	604		10	21
1882	411	6	12	690		11	18
1883	999	17	8	1,253		15	22
1884	824	15	12	921		17	21
1885	2,360	12	5	1,170	2	0	0
1886	2,199	3	23	1,026	2	2	20
1887	2,599	7	9	2,357	1	2	1
1888	1,699	9	19	2,106		16	3
1889	2,709	0	18	1,391	1	18	22
1890	2,774	13	20	1,122	2	9	10
1891	2,909	10	13	2,019	1	9	0
1892	3,093	13	2	2,259	1	7	9
1893 (9 months ending Sept. 30)	3,171	9	16	2,389	1	6	13
1894	546	17	16	981		11	3
1895	489	7	10	594		16	11
1897	282	5	6	308		18	17
1898	1,329	9	14	631	2	2	3
1899	692	3	18	993		13	22
1900	1,379	16	8	1,519		18	2
1901	439	11	16	779		11	5

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1902	565	10	0	719		15	18
1903	419	8	23	712		11	19
1904	804	9	18	552	1	9	4
1905	1,401	9	18	1,187	1	3	15
1906	1,492	4	18	1,394	1	1	10
1907	893	10	0	495		16	2
1908	2,458	3	0	754	3	5	5
1909	3,017	14	0	1,373	2	3	23
1910	2,936	6	0	1,616	1	16	8
1911	278	19	1	395		14	2
1912	127	5	0	314		8	3
1913	162	6	0	255		12	18
1914	182	10	0	358		10	5
1915	562	14	0	321	1	15	1
1916	287	14	10	282	1	0	10
1917	58	14	19	46	1	5	12
1918 (mortared)	2	16	0				
1919	16	1	0	58		5	13
1921	13	2	0	85		3	2
1922	63	13	0	209		6	2
1923	36	1	0	74		9	17
1924	8	9	0	27		6	6
1926	92	13	12	201¼		9	4
1926 (mortared)	3	8	0				
1927	250	9	6	710		7	1
	71,712	2	5	62,761			

OVENS

Location

Ovens gold district is situated in Lunenburg county on a small point of land on the west side of Lunenburg bay, and 10 miles by wagon road southeast of the town of Lunenburg.

Geology

The rocks, which consist of slates, form a bluff 50 feet high, facing the sea. The washing of the waves against the bluff wears away the softer beds of slate and forms deep indentations, fancifully called ovens, hence the name of the district.

The slates are closely folded in an anticline that can well be seen on the shore of Lunenburg bay and has been traced westward to Rose bay, where it is also well shown. This anticline pitches east at an angle of 5 degrees and the strata of the north limb dip north 60 degrees to 70 degrees, and those on the south limb dip south between 80 degrees and 85 degrees.

Some distance south of the anticline occur several igneous dykes described as dioritic and running nearly parallel with the strata. These are small, varying from 5 feet to 9 feet in thickness, and probably in no way connected with gold deposits.

Character of the Deposits

The quartz veins are interbedded and lie on the north limb of the anticline. Unfortunately these are only from a fraction of an inch to 1 or 2 inches in thickness and cannot be worked profitably to any great depth. The most important is the Bent lead consisting of corrugated quartz. A short distance to the south of this is the Dowling lead and to the north lie the Campbell, Trauenwizer, McCulloch, and Tucker leads. A number of angulars dipping west 60 degrees to 90 degrees enter the Bent lode and make it auriferous at the line of intersection.

The most of the gold from this district was derived from the shore placers. The wearing of the bluff and debris from the bluff by wave action led to the concentration of the gold in the sands on the shore, especially in the crevices in the slate over which the sand was washed by the waves and shore currents. The richest placers were found in the immediate vicinity of the anticline in Cunard cove and in Rose bay. Farther south the sands of the shore furnished low-grade washings.

History

The Ovens was one of the first places in which gold was discovered in Nova Scotia and in the early sixties there was a considerable interest manifested in the district, but since then it has failed to attract much attention.

The discovery that aroused the public interest was that of an auriferous quartz vein three-fourths of an inch thick, discovered by James Dowling on June 13, 1861. This was on the promontory called the Bluff. A number of land areas were taken up, but when John Campbell, a month later, discovered gold in the sand on the shore, attention was turned to alluvial mining. In 1862, three or four areas were still being worked, but the deepest pit on any vein was 33 feet, none other being deeper than 23 feet. The alluvial washings on the shore were pretty thoroughly worked in 1861, but were still remunerative in 1862, and it was estimated that up to the end of the year 1862 about 2,000 ounces had been obtained from this source. That constitutes the bulk of the total production of the district.

In 1863 very little work was done and nearly all the lessees had abandoned their workings. The Chief Gold Commissioner in attempting to account for this, expressed the opinion that it was due partly to the limited size of the areas and to the reckless expenditure of money in the erection of costly hotels, stores, and shops, which should have been spent in the introduction of up-to-date mining machinery. The spring of 1864 saw a resumption of work, but it was almost immediately discontinued. The depression continued through 1865, but in 1866 limited operations were carred on by McCulloch and Company, and Mr. McDonald. By the former, several shafts 30 to 60 feet deep were sunk on a 5-inch lode; a tunnel was also driven 140 feet in from the shore. Mr. McDonald sank some shafts on the Bent lode south of the lode worked by McCulloch and Company. McCulloch and Company ceased work early in the spring of 1867, but during the year some work was done on the Bent lode by Messrs. Fairchild and others, who continued operations during the early part of 1868. This year some lodes were opened and worked, to a slight extent, by Mr. Drew, who also erected a furnace for roasting the quartz. In 1869 almost the only mining done was that carried on by Messrs. McKay and Ross on the Bent and other lodes opened on the McCulloch areas. Work was entirely suspended the following year, and except for a little prospecting the district has since received slight attention. In 1896 and 1897 some little interest was again aroused, and in 1896, A. J. Cowie reported a yield of 5 ounces from 26 tons; in the following year the Acadia Gold Reduction Company extracted 78 ounces of gold from 210 tons of ore.

General Development

The placers have been practically exhausted, although it is said that a year or two ago two men washed out $60 worth of gold in 15 days.

The Bent lead has been worked more than the others, altogether a length of 3,000 feet, but chiefly by open-cut and shallow shafts, the deepest of which was 65 feet—the Blossom shaft. The Campbell, Trauenwizer, and Dowling were also worked by open-cut, but none of them very deep. On the Trauenwizer a tunnel was driven from sea-level along the vein 140 feet. Attempts have also been made to cut the leads farther west.

A Chilian mill still stands in this district and consists of two sets of wheels. Each set consists of two white granite wheels 4 feet in diameter and 1 foot thick revolving on a base of white granite 5 feet 8 inches in diameter and 13 inches thick.

PLEASANT RIVER BARRENS[1]

Pleasant River Barrens gold district[2] is situated in the northwestern part of Lunenburg county, on the road between Bridgewater and Pleasant River, 15 miles north of the town of Bridgewater, 6 miles southeast of Pleasant River station, and 3 miles south of a siding on the Caledonia branch of the Canadian National railway.

---

[1] Plan published.

[2] Faribault, E. R.: Geol. Surv., Canada, Sum. Rept. 1913, pp. 259-263.

The district lies on a dome of quartzite of the Goldenville formation of the Gold-bearing series. This dome approaches more the circular form than any other known in the Gold-bearing series. Thick, massive beds of quartzite, dipping at low angles and overlapping one another, outcrop nearly everywhere and stand out prominently in long, curved, and parallel ridges, 5 to 30 feet high. The dome has its centre on area 32, block 2. From the centre, the axis runs south 83 degrees east (magnetic), plunging to the east at an angle increasing gradually from a very low angle near the centre to 30 degrees; and in the other direction, its course is south 85 degrees west, pitching westerly at an angle increasing gradually to 20 degrees. The dip of the strata to the north and south increases also gradually from the centre to 44 degrees on the north limb and 35 degrees on the south. Radiating from the centre of the dome toward the east, southeast, and northeast, are several subordinate gentle undulations, or flexures of the strata, on which fractures were formed favouring ore deposition.

All the veins found in the district are comprised within an area measuring 1¼ miles east and west by 1¼ miles north and south. They are not numerous and do not occur in groups close to one another, as in some of the more important gold districts, but they are rather scattered around the broad dome. The two types of auriferous quartz veins are represented, the interbedded and the cross veins.

The richest ore-shoot was found on the Dunbrack lead, at the junction of an angular entering on the foot-wall side and coming from the southwest. It pitches north 25 degrees and was found to be very irregular in size and value. A small ore-shoot was found on the Joe Thompson lead at the junction of a 12-inch angular coming in from the northwest. The angular does not actually pass into the lead, but terminates in the slate underlying the lead, where it ramifies into small stringers impregnated with gold, which constitute the ore-shoots. The ore is said to pinch out at a depth of 20 or 30 feet. The ore deposits developed on the S. Ernst and the Deal fissure veins, and possibly also on the Brignell, occur apparently in shoots at the intersection of interbedded veins and angulars.

Gold was discovered in the eighties. Since then a few veins have been developed, but no very important operations have been carried on. On the Pine Tree lead, which was traced on the surface 400 feet, a shaft was sunk 75 feet and a level was driven west 75 feet, above which the lead was stoped to the surface. This lead is 6 to 8 inches wide at the surface and 3 inches wide at the bottom of the shaft.

The Mill lead, also called McDonald lead, was worked on the Wade property, immediately east of the road. It is about 8 inches, strikes south 77 degrees east (magnetic), and dips north 30 degrees. Three shafts have been sunk, the one farthest east to a depth of 75 feet, the next one 50 feet, and the west one 30 feet. The block of ore stoped extends from the bottom of the three shafts to the surface and for a length of 180 feet.

The Dunbrack lead was worked on the Wilson property, 800 feet east of the road. An inclined shaft was sunk 125 feet on the ore-shoot pitching north 25 degrees. This was worked for a time by the Field of Gold Mining Company. The ore-shoot was lost in 1891 and the Dunbrack was not worked again until 1895 when it was taken over by J. W. Ferguson and Wm. McNeil and it is claimed that the ore-shoot was recovered.

On the Brignell vein a shaft was sunk 85 feet and levels driven 35 feet southwesterly and 40 feet northeasterly, and some stoping was done on the former level. The vein is very irregular in size, the largest portions varying from 6 to 48 inches, with a gouge following the hanging-wall. The Blue lead and the Mottled lead were both sunk only 20 feet in depth on a dip of 25 degrees and 28 degrees respectively. A 5-stamp mill was erected in connexion with the shaft engine on the Brignell vein for testing the ore.

One-quarter of a mile southwest of the Brignell is the Joe Thompson lead, on which two shafts were opened from the same point, one 25 feet following the junction of the angular, and the other 48 feet on the dip of the lead. Some ore was crushed at the Brignell mill.

Three-quarters of a mile south of the Wilson mine, on the west side of the road, is the Simeon Ernst mine on a fissure vein striking east and west (magnetic), and dipping north 53 degrees. It was opened in 1903 and prospected by Simeon Ernst, Aaron Crouse, and Baker for 1,200 feet along its outcrop. The explorations were much hindered by the heavy surface covering. A shaft was sunk 65 feet at the junction of a 6-inch angular entering the vein from the south and dipping westward 45 degrees. At the depth of 60 feet levels were driven eastward 40 feet and westward 30 feet, and above this 10 to 16 feet of stoping was done. The vein is 15 inches at the surface and 12 inches at the bottom of the shaft. Fifty feet east of the shaft the vein pinches to a 'hulk', but it is said to have been cut farther east on both sides of the road by Baker and Crouse, where rich float has been found. Westward from the shaft it was traced by shallow pits for a length of 630 feet, and found to vary from 23 inches down to nothing. It is reported that 53 tons of ore crushed have yielded 22 ounces of gold.

RENFREW[1]

Location

Renfrew gold district lies in Hants county 4 miles northwest of Enfield, a station on the Canadian National railway, 27 miles from the city of Halifax.

Geology

The[2] anticline on which this district lies is a continuation to the east, after many subdivisions into small anticlines and synclines, of the Mount Uniacke anticline, and its axis here runs north 70 degrees east (magnetic). It crosses Stinking lake at the west end of the district, about its middle, following Number-eight brook down to Ninemile river and becomes concealed by Carboniferous strata at Little Ninemile river.

The fold is unsymmetrical, the axial plane dipping north, and it is the broadest and most flattened elliptical dome met with in the eastern part of the province. The strata dip at low angles for some distance on both the north and south limbs, the dip increasing gradually until it reaches 50 degrees at a distance of 2,500 feet south of the axis, and 65 degrees at a distance of 5,000 feet; whereas on the north limb it reaches only 30 degrees at a distance of 2,500 feet from the axis, and it does not exceed 45 degrees farther north, the axial plane, therefore, dips north about 75 degrees. At the western end of the district the anticline plunges at angles varying from 18 degrees to 25 degrees, and thick beds of quartzite stand out in bold relief for many hundred yards, forming long, undulating, and faulted curves on the end of the dome, near Stinking lake. At the eastern extremity of the dome, in the vicinity of Ninemile river, the strata curve more abruptly and the fold plunges at an angle of about 20 degrees. The centre of this broad dome could not be exactly located, the northern part of the district being covered by drift for the most part, but it is situated on or near Number-eight brook and at no great distance to the east or west of area 833, block 2.

Extensive erosion has taken place and strata that were originally deposited 8,700 feet below the base of the Halifax formation are here exposed.

Three gentle undulations radiate from the centre of the dome, one southwesterly and two westerly, the middle one of the three being the main anticline. The two western undulations run towards Stinking lake, with strata dipping westerly at angles less than 32 degrees.

The southwestern undulation, which is by far the most important, widens out as it recedes from the main dome, plunges to the southwest at an angle gradually increasing from 0 degrees at the centre to 50 degrees at the extreme limit, and the axis-plane dips north at an angle probably near 75 degrees. On the northwestern side of this undulation, the measures have been subjected to enormous strain and shearing, producing a series of flexures and right-hand faults roughly parallel with the axis of the undulation and giving horizontal displacements ranging from a few feet up to 200 feet.

Character of the Deposits

The veins that have been developed are of the interbedded type. Although the discovery of auriferous boulders in the thick drift on the north side of the anticlinal axis has led to some exploration of the north limb, no veins of any importance have been found here. The strata on this limb dip at angles varying from 10 degrees to 35 degrees, rather low for the occurrence of paying veins, and at any rate for working narrow veins at an advantage. Numerous rich boulders have been found, especially on the undulations between Stinking lake and the Rawdon lead, but all search for their source has proved fruitless. All the mining operations have, therefore, been conducted on the south.

---

[1] Plan published.

[2] Faribault, E. R.: Geol. Surv., Canada, vol. XII, pt. A, p. 169.

"The south side[1] of the southwestern undulation contains the most extensively operated veins of the district. On the south side of the dome, opposite the centre, the strata run on a straight course parallel with the axis of the main fold, and they have been tightly compressed in the process of folding by a direct lateral force from the south which has prevented the formation of fissures. But, as they approach the southwestern undulation, they curve gradually round, and, coming under the influence of a new full shearing force, develop, in some slate belts, numerous fissure-veins. The veins gradually increase in size and in number, until they attain their maximum width on or about the apex of the undulation, forming a zone of fissure-veins which possess all the characteristic features of a promising field for permanent and deep mining. Important streaks of special enrichment have been worked on many leads along this zone." They are generally well defined and dip to the west at a low angle probably corresponding with the plunge of the undulation. This has not been determined, however, owing to the lack of plans of the underground workings. They crop out at the surface along a well-defined line. "The line of special enrichment runs from the centre of the dome, on Number-eight brook, south 47 degrees west (magnetic), to Parker brook, some 500 feet below the Rawdon road bridge, thence curving to the south it crosses Renfrew brook above the Colonial dam and extends to the works on the Andrew lead, which marks about the extreme south limit of the formation of fissures, on lot 1826, block 1, giving a total length of 8,500 feet.

In the first 4,600 feet, from the centre of the dome to the Phillips lead at Parker brook, some thirteen leads have been uncovered, most of them recently, all lying at angles under 40 degrees, many of which have proved auriferous and promising, but none has so far been operated.

The next 1,600 feet of the zone, south of Parker brook, includes a succession of twenty-two known veins, comprised between the Phillips and the McClure leads, most of them included on the property of the Pictou Development Company. Their length varies from 200 to 1,000 feet, and their average thickness is above that of the veins in most districts in the province. Proceeding from north to south, the veins on which most mining has been done come in the following order and at distances stated from the McLeod lead:

Leads	Thickness in inches	Distance from McLeod lead, in feet	Deepest shaft, in feet	Length opened, in feet	Remarks
McLeod	9 to 15	0	360	1,350	Two rich streaks; eastern one dips east, western, west
Preeper	10 to 36	95	125	800	Good strong lead
Foundation	5 to 10	150	400	600	Rich lead, traced west a long distance
Hay	9	210	120	600	
Paper Collar	6	285	150	300	
Kilcup	10 to 16	380	50	1,000	
Clements	10 to 24	460	75	600	Good large belt
Sims	10 to 48	655	112	1,200	Good large belt of constant value
Johnson	8 to 36	960	90	1,000	
North Ophir	12 to 18	1,370	350	1,000	Belt of four leads, rich streak dips west
South Ophir	8 to 12	1,510	400	800	Rich pay-streak dips west
McClure	12 to 15	1,585	185	500	Slate belt with quartz

---

[1] Faribault, E. R.: Geol. Surv., Canada, vol. XII, pt. A, p. 171.

The remaining 2,300 feet of this zone, between the McClure belt and the Andrew lead, contain, as far as the surface developments have gone, only ten leads and none has proved of special value. Rich drift has, however, been found in this section, south of Renfrew brook, but it may come from the leads worked farther north."

On the northwest side of this important southwestern undulation, in the faulted area, numerous quartz veins have been found, some of which are auriferous, but are so faulted and twisted as to make it doubtful if they can ever be extensively worked with profit. Some exceedingly rich ore was taken from the Jubilee vein on a small local undulation in this faulted area. It may be that other veins are enriched where they are affected by this local fold, and possibly the rich float discovered on Parker brook and Rawdon road, immediately north of the bridge, originated from veins similarly affected.

Some 5,000 feet south of the centre of the dome a number of veins have been operated on the free claim and area No. 2. These occur in an area of local disturbance, where there was some faulting and subordinate folding, and they were worked 150 feet along their course and to depths of 100 to 175 feet. At a depth of 175 feet the formation is thrown to the south about 8 feet by a fault. Some of the veins thin out before reaching this depth, and it has not yet been ascertained whether the paying ore continues below the fault.

"A series of some thirty or forty veins has been uncovered on the southeastern flank of the dome at a distance varying between 2,000 and 5,000 feet directly south of the centre. A few of them have shown gold, but none has been operated. The pay-streaks on this zone probably dip eastward.

On the eastern pitch of the main anticlinal fold, 4,000 feet east of the centre of the dome and half-way down Number-eight brook, a few boulders of gold-bearing quartz have been found, but all search for the veins in situ has been fruitless, only a few veins of low-grade ore having so far been found."

History

William Thompson appears to have been the first discoverer of gold in this locality and is said to have found an auriferous quartz boulder on the banks of the brook near his mill. The excitement incident to the discovery of gold at Tangier led to some prospecting by the residents of Ninemile River settlement and John McPhee discovered quartz veins near William Thompson's mill in the summer of 1861. Little attention was paid to the discovery, however, although it was made public, but when it became known that towards the last of April, 1862, Andrew Parker had found an unusually rich quartz vein near Thompson's mill there was a rush of prospectors into the district. On April 29, arrangements were made with the owners of the land to allow mining areas to be laid off and leased, it was immediately proclaimed a gold district, and prospecting and mining started in real earnest. In a few months three crushers were in the course of erection and by the first of November two of them were in operation. Some very rich quartz was crushed this year and among the veins opened may be mentioned the two free claim leads, the Preeper on area 343, the Shubenacadie, a lead on the ninth range of areas varying from 8 inches to 1 foot, and one on the tenth range of areas 14 to 20 inches thick.

In 1863, the production was nearly double that of 1862, but was only 785 ounces. Most of the early mining of this district was conducted by operators who held small tracts of land and worked on a small scale, and the first four years of the district's history were not noticeable for any marked production. In 1863, George H. Madill did quite a lot of work on areas 1, 2, 59, and 60, the property of the Hartford Gold Mining Company, and among others who engaged in mining may be mentioned Charles Sim, I. Fleming, A. Cox, and the Chebucto Mining Association.

The year 1864 saw an increase in the production, although no crushing was done during the last three months on account of the drought. Among the operators this year were F. S. Andrews, the Colonial Gold Mining Company, George Madill on the Hartford Company's property, and H. B. Prince on the areas owned by the Renfrew Gold Mining Company. The total yield of gold in the district during 1863 was equivalent to $203.90 per man employed, and the product for the nine months of 1864 gave $385 per man.

There was a slight falling off in the production in 1865. George Madill continued to work areas 1, 2, 59, and 60; the Ophir Mining Company, first heard from this year, reported 245 ounces from areas 162 to 164 and 197 to 199; and the Renfrew Company and others reported small amounts.

In 1866, there was a very decided increase in production, the gold extracted being about six times that of the preceding year. Many areas passed into new hands, larger holdings were acquired by the operators, new and larger crushers were erected, and mining was vigorously carried on. The Ophir Mining Company was by all odds the greatest producer of the year, reporting over 4,600 ounces; and active mining operations were conducted by this company on the No. 1 or North and No. 2 or South leads. The New York and Renfrew Company also sank four shafts on the No. 1 North lode west of the Ophir Company, besides working seven lodes on the free claim, varying in width from 2 to 18 inches. Messrs. Allen and McClure sank four shafts on a 10-inch lode north of No. 1 North lode and returns were made by Brayton Ives and the New Haven Company.

The year 1867 was the banner year of the district, a production of 7,904 ounces from 7,222 tons making this the leading district of the province. In point of profit it ranked next to Sherbrooke and the yield for the year averaged $895.30 per man employed. As in the preceding year, the Ophir Mining Company was the principal producer, and reported over 6,000 ounces. Shafts on both the North and South were deepened and stoping was active; the same company also opened a 5-inch lode to the south of the South lode. The property of the New York and Renfrew Company had passed into the hands of the Hartford Company, who continued the work on the North lode and on the free claim. Sinking and stoping were done on the McLeod lead by Messrs. Allen and McClure and some distance to the south of the Ophir property a lode was opened by Mr. Andrews.

In 1868, the production dropped to less than half that of 1867 and over 3,000 ounces of this was reported by the Ophir Mining Company, who continued vigorous mining on the North and South lodes as well as on the McClure lode. The Brook lode was also worked and exploratory crosscuts were started from the North and South lodes. Crushing was done at a waterpower, 16-stamp mill. The Hartford Company did some work on the North lode, and their successors, the Colonial Company, sank a shaft on the South lode, and stoped out a portion of the McLeod lode, besides doing some intermittent work on the free claim, and opening the Phillips lode about 100 feet north of the McLeod lode. Some stoping was done this year on the lode opened in 1867 by Mr. Andrews.

In 1869, the principal operators were the Ophir Mining Company and the Colonial Company. The former continued operations on the North, South, McClure, and Brook lodes. The shaft on the North lode was deepened to 400 feet and that on the South lode to 342 feet, but work on both of these was suspended late in the year. Little was done on the Brook lode, but stoping was actively conducted on the McClure lode. The Colonial Company continued to mine the North lode until the influx of water from the abandoned Ophir workings compelled it to desist. Sinking and stoping were, however, conducted on the McLeod lode and on an 8-inch lode south of the McLeod. Operations on the free claim were carried on this year by W. Gay.

There was a very pronounced decrease in production in 1870 and no very extensive operations were attempted. The Ophir Mining Company stoped out some of the South lode to the surface, sank two shafts on the Hay lode, and removed some ore by underhand stoping. The latter lode was also mined by the Renfrew Company, and operations were continued on several lodes on the free claim, but principally on the Bayne lode from which ore was hoisted through a 132-foot shaft.

In 1871, about the same production was reported as in the preceding year, and work was carried on by the New Haven Company, the Renfrew Company, the Hartford Company, and the Ophir Mining Company, nearly the whole production being reported by the last two companies. The Ophir Mining Company extracted 625 ounces from 1,436 tons and the Hartford Company 383 ounces from 494 tons. These two companies suspended operations in 1872, and mining in this district was almost altogether abandoned. The McLeod lead on the Ophir property was worked to a small extent on tribute, and the Preeper lead was reopened by other parties after an abandonment of five years. Production continued to drop off until in 1874 only 3 ounces were reported. In 1873, Mr. McClure did some trenching in the eastern part of the district, and exposed several veins, none of which was very promising. He continued prospecting in 1874, during which year the Preeper lead received a little attention.

For a number of years mining in this district was almost at a standstill and no extensive work was attempted, and the history can be little more than a list of the operators with the names of the leads on which they carried on their limited operations. In 1875, the Preeper lead was worked on areas 342 and 343, the Clements lead on area 319; and a lead overlying the Preeper on area 344 was worked by Mr. Macdonald for the Hartford Mining Company. In 1876, the extension of the Ophir lead on R. G. Fraser's property was taken by a company and reopened, but the results were unsatisfactory. In 1877, Mr. McClure reopened the McLeod lead on area 309 and a little work was done on the Clements lead as well as on areas 318 and 319 on a lead overlying the Preeper. In 1878, work on the McLeod lead was discontinued on account of the quartz becoming thinner and impoverished, and later in the year the Hay lead was worked a little, but abandoned the next year. In 1879, Mr. Haydon reopened the Preeper lode and later on the Old Time lode. A few others were engaged in taking out small blocks of ore from various lodes. In 1880, the Hartford property was reopened, and in 1881, Dr. Rae did some work on the Brook, No. 2, and Bain leads. He was the principal operator in 1882 and mined the Hard, Brook, and Bain leads, but discontinued the following spring.

In 1883, Mr. A. A. Hayward, manager for the Empress Gold Mining Company, started operations in this district and for a number of years was the only important producer. The eastern extension of the Preeper lode was opened, the Ophir mill repaired, a 3-drill air compressor was put in, and other preparations made for systematic mining. Active operations were carried on in 1884, so that although the production of the preceding year was almost nil, this year 570 ounces were extracted from 1,679 tons of ore. In 1885, work at the Empress mine continued, although crushing had to be stopped during a part of the season owing to the drought. A little work was done this year by Messrs. D. A. McDonald and Rae. In 1886, operations were not so brisk, but in 1887 there was renewed activity and 750 ounces were reported from this district. The free claim was worked a short time and then sold to E. C. McDonald and associates, but the principal work was that at the Empress mine, where overhead stoping was carried on, a large amount of ore blocked out on the Foundation lead, and a crosscut driven to the Hay lead, from which the ore was to be hoisted through the main shaft on the Foundation lead.

In 1888, the free claim was reopened by E. C. McDonnell and for a few years returns were made from it and the Empress mine. The free claim was actively mined in 1889 and reported a higher yield than the Empress. At the latter mine crosscuts were completed to the Hay and Preeper leads opening up a large body of ore, and a new waterpower 10-stamp mill was erected. The year 1890 saw a greatly decreased yield in this district, and at the end of this year work on the free claim almost completely ceased. The Empress mine owned by Mr. North was under the management of D. S. Turnbull, but the crushings were not so great as in previous years. The Ophir mine was unwatered in 1891, but the result seems not to have been very satisfactory.

In 1894, the Pictou Development and Mining Company, Limited, was organized to acquire and work the properties of the New Haven and Renfrew Company, the Colonial Gold Company, and the North Mining Company. In 1895, twenty-five men were employed and operations were carried on on the Preeper, McLeod, and Clements leads under the management of D. A. McDonald. This company made returns for four or five years, the largest being 439 ounces in 1896.

In 1900 came a revival of mining in this district, and the production for four years placed Renfrew again in the group of important mining districts. This was due to the milling of some very rich quartz won from the Jubilee and neighbouring leads. In 1900, 4,450 ounces were reported from 459 tons crushed in this district, over three-fourths of which was returned by E. and C. Thompson and the balance by the Big Five Mining Company. This year twelve men were employed on the Thompson property, a shaft sunk 105 feet, and two levels driven east 44 feet. Work was carried on by the Big Five Mining Company and an old 60-foot shaft was extended to a depth of 110 feet, levels were driven, and stoping was done on a belt carrying two veins, one on the hanging-wall of about 6 inches and one on the foot-wall of about 4 inches, the western continuation of the Jubilee lead. In 1901, under the management of J. D. Horne, the shaft was deepened to 156 feet and a third level driven east to the Thompson mine. Active operations were carried on by C. Thompson who this year had thirteen men at work. The shaft was sunk vertically for 65 feet and from the bottom was continued 75 feet on the vein. From May, 1900, to August, 1901, 5,470 ounces of gold was extracted from 452 tons of ore taken from this mine. The Messrs. Thompson continued operations during 1902 with good results, although the ore was not nearly so rich as it had been; small returns were also made by the Big Five Mining Company and by the Warwick Gold Mining Company, operating on some flat leads near the apex of the anticline.

In 1903, the latter company made small returns, but the principal operations were carried on by the Pictou Development Company on the Thompson property. Most of the stoping was on the Jubilee lead, but a 12-inch lead south of the Jubilee received some attention. This company continued operations in 1904 and the shaft reached a depth of 365 feet, but the production was small. The following year work was of a very desultory nature and very little gold was reported.

In 1905, the Eagle Mining Company, Limited—Otto Kramer, manager—acquired the property of the Pictou Development Company, and commenced sinking a shaft on or about area 456 on the Maria Walker lead. In 1906, the shaft was 45 feet deep and levels were driven, but no stoping had been done, although a small production was returned. In 1907, twelve men were employed and a yield of 77 ounces from 538 tons was obtained. In 1908, no ore was crushed, but development and construction work was done. A small amount of sinking was done on the Maria Walker lead, but this was discontinued in August and the reopening, clearing, and retimbering of the old Empress mine claimed the attention of the company. Operations were carried on during the winter, but the mine was closed early in the spring of 1909.

In 1910, M. J. O'Brien, with M. R. O'Shaughnessy as manager, unwatered the Thompson and Jubilee shafts. A quantity of material was taken from the scaffolds and yielded fairly good returns. At the Jubilee mine, the 400-foot level east was extended 28 feet following the break encountered in the former work, and from a point 25 feet east of the break a crosscut was driven south 22 feet. From the 200-foot level, 60 feet east of the shaft, a crosscut was driven north 14 feet. Tests indicated no pay ore and work at these shafts was discontinued. The Empress shaft on the Foundation lead was unwatered. Mill tests were taken; 200 tons from the Preeper lead, 100 tons from the Foundation lead, and 150 tons from the McLeod lead gave from $0.50 to $2.25 per ton. The shaft was allowed to fill with water. The 320-foot shaft on the McLeod lead, known as the Chummy shaft, was unwatered. It was sunk a farther 67 feet, making its total depth 387 feet. At 360 feet, levels were driven east 140 feet and west 100 feet, and stoping carried on over the east drift. The lead as opened up by the above developments shows from 4 to 8 inches in width in a hard, banded slate, striking east and west, and dipping at 50 degrees to the south. Gold recovered was principally in the form of nuggets. In the west workings, the lead is split in two sections, and contains considerable chalcopyrite. The 110-foot shaft on the Sims lead was cleaned out and sunk 42 feet, to a total depth of 152 feet. This lead, 10 to 20 inches in width, is in a banded bed of slate and quartsite 3 feet 6 inches wide, striking east and west, and dipping to the south at 53 degrees. During this year 1,834 tons of ore was mined and crushed, yielding 624 ounces gold. In 1911, operations were confined to the McLeod or Nuggety lead. The McLeod shaft was sunk 88 feet, reaching 475 feet in depth. At 450 feet, levels were driven east 68 feet and west 48 feet. The 360-foot level was extended east 43 feet and west 160 feet, total lengths of 183 and 260 feet respectively. Stoping was carried on above the 260- and 450-foot levels both east and west of the shaft. A yield of 1,527 ounces gold was obtained from 3,493 tons of ore mined and milled. In 1912 mining was confined to the McLeod or Nuggety lead. Upon this lead the 360-foot level was driven 13 feet east and 83 feet west; the 460-foot level was driven 163 feet east and 195 feet west, making the level 231 feet east and 243 feet west. From a point on the 360-foot level 85 feet west of the shaft a crosscut was driven 25 feet south; from a point on the 460-foot level

40 feet east of the shaft a winze was sunk 58 feet. Stoping was carried on above the 360-foot level west, and above the 460-foot level east and west. The best values were recovered from the west workings; 2,908 tons of ore was mined and crushed, yielding 1,182 ounces gold. In 1916 considerable prospecting was carried on and a few promising leads reported. During 1917, 1918, and 1919 considerable work was done developing the Curley and 13th-of-June leads about 800 feet north of the Jubilee property, but was discontinued in July, 1919. A shaft was sunk 100 feet on the 13th-of-June lead. The lead for the first 50 feet dipped at an angle of 75 degrees flattened out to 50 degrees, and finally at the 100-foot level had a dip of only 30 degrees. At a depth of 50 feet a level was driven following an undulation in the lead and then in a southerly direction for 120 feet. A crosscut was driven from the 50-foot level east 130 feet, cutting the Curley lead at 73 feet. Levels were driven on the Curley lead 98 feet north and 60 feet south from the crosscut. Ten leads were cut in the crosscut, and on two others, besides the Curley lead, a small amount of drifting was done. At the 90-foot level a drift 120 feet south was made and a crosscut was driven to the Curley lead. The structure of the veins is complicated by minor undulations. Rich streaks were found in the Curley and on the 13th-of-June leads on the south side of the shaft. The values appear to be confined to the vertical portions of the veins.

In 1922 George Cameron unwatered the shaft of the Sandy McPhee property. This shaft is 80 feet deep with a drift east 25 feet at the 60-foot level. In 1927 Cameron obtained an option on the M. J. O'Brien property, did a small amount of work, and found some very rich ore.

General Development

As is the case with nearly all the districts, the best idea of the extent of development of the Renfrew deposit can be got from the plan on which the location and depth of the shafts are indicated. The ore has been removed by numerous shafts sunk on the dip of the veins and very little crosscutting has been undertaken. Operations have been conducted only to limited depths and it seems probable that many of the pay-shoots were not worked out. The zone including the veins lying between the McLeod and McClure leads, although worked out near the surface, offers an especially good field for exploration at greater depth. The Ophir leads were very rich along shoots dipping west and it is the belief of old miners that those shoots were not worked out. The group of six veins lying between the Paper Collar and McLeod inclusive, and comprised within an area 270 feet wide, could be worked advantageously at greater depths by a system of crosscutting from the 400-foot level of the Foundation lead. There is in this series of leads an *en échelon* arrangement of the pay-shoots, the shoot in any one vein lying somewhat to the east of that in the vein immediately to the south. After the discovery of a shoot on any lead it will be necessary to go east to crosscut to a vein lying to the north, and west to crosscut to a vein lying to the south. A similar system of operations might be applied to the Clements and Sims leads. The southern extension of the same zone as far south as the Andrews lead is also worthy of the attention of surface prospectors, as it is probable that the drift conceals a series of interbedded auriferous veins lying between the McClure and the Andrews.

Important waterpower is available here and has been utilised in past operations. Renfrew brook running along the southern part of the district has several important falls and rapids, and five falls of 20, 35, 15, 35, and 15 feet respectively have been utilised above the main road. Six lakes are available for reservoirs and a great deal of power could be developed both above and below the main road.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1862	306	0	0	171	1	15	10
1863	785	7	7	574	1	7	7
1864	874	5	6	750	1	3	8
1865	820	12	23	1,114		14	18
1866	4,176	3	17	4,181		19	23
1867	9,401	2	10	7,770	1	4	8
1868	4,611	2	19	7,560		12	5
1869	3,097	15	7	7,258		8	12
1870	1,171	18	11	3,243		7	2
1871	1,179	17	16	2,463		9	4
1872	323	3	8	855		7	13
1873	59	16	18	255		4	16
1874	3	3	7	10		6	7
1875	47	16	6	113		8	11
1876	75	14	10	164		9	5
1877	207	13	4	294		14	3
1878	155	17	10	380		8	5
1879	104	1	20	419		5	0
1880	155	14	13	537		5	19
1881	269	8	13	583		9	5
1882	196	19	10	416		9	11
1883		17	10	3		17	10
1884	569	18	0	1,679		6	18
1885	639	10	0	641		19	9
1886	233	17	0	428		18	15
1887	750	4	14	1,234		12	3
1888	642	16	10	1,145		11	6
1889	697	17	15	1,070		13	1
1890	253	10	12	760		6	15
1894 (year ending Sept. 30)	590	0	0	757		15	14
1895	1,366	17	0	1,242	1	2	0
1896	389	10	0	557		13	23
1900	4,450	15	22	459	9	13	22
1901	3,358	5	6	751	4	9	10
1902	1,374	11	1	974	1	8	5
1903	1,717	2	12	610	2	16	7
1904	185	0	0	701		5	7
1905	36	5	0	512		1	10
1906	62	10	0	217		5	18
1907	75	10	0	528		2	19
1909	45	0	0	180		5	0
1910	624	10	0	1,834		6	19
1911	1,527	0	0	3,493		8	18
1912	1,182	11	0	2,908		8	3
1913	190	19	0	476		8	1
1927	38	14	0	½	77	8	0
	49,029	7	1	62,282			

SALMON RIVER[1]

Location

Salmon River gold district (also known as Darrs Hill) is situated on the eastern side of Salmon river in the eastern part of Halifax county, 4 miles from Port Dufferin. It is distant from the city of Halifax 70 miles by water and 95 miles by post road, and from Shubenacadie on the Canadian National railway 74 miles by a good wagon road.

---

[1] Plan published.

Geology

The surface of this district is largely covered with drift, and there are so few outcrops that the structure has been determined almost wholly from underground geology. The published plan was constructed from plans and sections of the underground workings, which, although giving the general structure of the main workings, made no claim to show the structure of the series beyond them, along the crosscuts towards the north and south. Later[1] detailed surveys made of the crosscuts and levels driven along the veins at depths of 134, 200, and 300 feet in the Dufferin mine show that instead of the Goldenville formation being brought up in a single anticline, as shown in the published plan, there are really two minor anticlinal flexures along the crest of the main plication.

The axes of the two folds are 245 feet apart. The northern fold is much broader than the southern, its south limb dipping south at an average angle of 45 degrees and its north limb dipping to the north at an angle gradually increasing to 78 degrees. At the surface the strata of the south anticline dip south at an angle of 62 degrees and north at an angle of 77 degrees and curve abruptly at the apex, which crops out 15 feet south of the vertical shaft. This fold plunges east and west at low angles, thus forming a long, narrow dome, the centre of which lies not far west of the vertical shaft. The axial planes of the two anticlines and of the intervening syncline lie approximately parallel and dip to the south, the syncline lying 48 feet from the southern anticline. The axial plane of the southern fold dips south at an angle of 77 degrees, being 48 feet distant from the vertical shaft in the crosscut from the 200-foot level, and 72 feet at the 300-foot level.

The rock exposures north of the Lake Eagle vertical shaft apparently indicate a double folding corresponding to that at the Dufferin mine.

A left-hand fault probably passes through Eagle lake in a southeast direction, giving a horizontal displacement of 1,500 feet, and another which has not been exactly located, lies about 850 feet east of the Dufferin vertical shaft with a possible displacement of 50 feet.

Character of the Deposits

The deposits occur as a series of saddle veins, lying in the planes of stratification, and the veins that have been worked are limited to the south anticline. The north anticline being broader, seems not to have afforded conditions favourable for the deposition of ore, for in the crosscut driven to the north from the 200-foot level in the Dufferin mine only one vein, and that but 1 inch thick, was cut between the syncline and the axis of the north anticline, and in the 45 feet that this crosscut is extended north of the axis not one vein was cut. Quartz veins, said to be auriferous, have, however, been uncovered at the surface, at a distance of 105 feet and more north of the axis.

On the south anticline mining operations have revealed the presence of a succession of saddle veins. The first discovery was made by means of pits and tunnels in the surface drift which is 10 to 15 feet deep, and it consisted of 30 to 40 inches of quartz running parallel with the strata and resembling an ordinary lode. A shaft was sunk on this lode and at a depth of about 30 feet it was found to be divided by what was at first thought to be a horse, but which later developments proved to be strata forming the apex of the anticlinal fold. The first mass of quartz proved to be a rider extending upward from the interstratified vein into the fractured strata above. This rider increased with depth to a thickness of 20 feet. The interstratified vein itself was 20 feet thick near the apex. Subsequent sinking and crosscutting has revealed several underlying veins.

The largest and richest ore-bodies are confined to the apex, especially for the first 200 feet in depth, and the synclinal trough forms the northern limit of the veins. The north lead operated by the first company was worked 120 feet in depth, to the bottom of the synclinal trough, where it ended; in the crosscut at the 200-foot level a north-dipping vein was found to end abruptly at the syncline, and in the crosscut at the 300-foot level an 8-inch vein was also observed to pinch out at the syncline 24 feet south of the vertical shaft. The zone of enrichment has also been found to extend only a short distance south of the anticlinal axis. In the crosscut south at the 200-foot level quartz veins were cut as far as 129 feet south of the anticlinal axis or 177 feet south of the syncline, but the continuation of the crosscut 194 feet farther revealed no more veins, whereas in the crosscut run 254 feet south of the syncline on the 300-foot level, quartz veins were discovered along its whole length. At this depth the fold gets a little broader and the zone of larger and richer veins appears to be less confined to the crest of the fold. At the 300-foot level the crest of the southern anticline was found to be broken up into two small anticlines. At the 400-foot level it is broken into three small anticlines, carrying several quartz veins which are of slight extent in depth on account of the small amplitude of the folds. At the 400-foot level the larger veins lie at a still greater distance south of the main axis than at the 300-foot level, and it may be that the crosscut driven 220 feet from the shaft does not extend far enough south to enter the zone of special enrichment. The veins are very persistent on their strike, the upper saddle having been worked a length of 1,788 feet.

---

[1] Faribault, E. R.: Geol. Surv., Canada, vol. XII, pt. A, p. 183.

In addition to the veins at the Dufferin mine several large veins have been uncovered 3,600 feet east of the Dufferin vertical shaft near the west shore of Eagle lake, and operations have been conducted here to a limited extent. This zone is the continuation towards the east of that of the Dufferin, and it may be that the whole zone along the anticline between the two properties is worth exploring.

History

A discovery of gold at Salmon River was reported in 1868, but it was not until 1880 that anything was found to merit the attention of the miner. It seems that some time during this year an Indian revealed the whereabouts of some rich quartz boulders, and later search, by trenching the heavy drift, exposed a rich vein 30 to 40 inches wide. About 100 tons of quartz was taken out and milled at Harrigan Cove and in sinking it was found that the vein divided to form the legs of a saddle.

The vein was so promising that in 1881 a 20-stamp mill was erected to be driven by power drawn from Salmon river, other necessary mine buildings were erected, and a considerable amount of work was done on the vein, which varied from 4 to 6 feet wide on the leg. Unfortunately, the property became involved in litigation and after being closed for several months was reopened some time in 1882 and the ore from the lode, which maintained its richness and size, was crushed at the waterpower mill which had been increased to 30 stamps. During this year Messrs. Ross and Hattie erected an 8-stamp mill they had brought from Dung cove near Isaac harbour to treat the ore from a 4-inch lead that had been discovered near the west shore of Eagle lake.

In 1883, work at the mine commonly known as the Dufferin mine was vigorously prosecuted and twenty stamps were kept running continually on the ore transported by tramway from the mine a half-mile distant. Mr. Hattie also did some work on the Hattie lode on the west shore of Eagle lake and prospected some other lodes. So energetic were the operations in this district that, although no considerable work was undertaken until 1881, by the end of 1883, 9,726 ounces of gold had been extracted from 12,574 tons of ore. Operations were carried on steadily at the Dufferin mine for many years, the most of the ore being taken from the lode on the south limb of the anticline. In 1885 the main shaft had reached a depth of 150 feet and towards the east the vein had been found to increase in width and richness. The returns for this year were 4,924 ounces, but the following year was the banner year of the district, 6,509 ounces being extracted from 11,628 tons of ore, an average yield of 11 pennyweights, 4 grains per ton. The works were pushed eastward where the quartz measured 4 to 12 feet in thickness. Half a mile above the dam from which power for crushing was obtained another dam was built, and power for pumping and hoisting was thus obtained and transmitted three-fourths of a mile by a system of pulleys and endless ropes. In 1887 work was carried on in both the east and west parts of the Dufferin mine, and the mill, which then consisted of thirty-eight stamps, was kept running continually. The principal work at the Dufferin mine in 1888 was to the eastward in the saddle-back or rider where the quartz reached in places a thickness of 20 feet. Pending a transfer of interests work was not so energetically carried on in 1889 and the production fell to 2,032 ounces.

In 1890, there was a reorganization and the property was afterwards controlled for a number of years by the Dufferin Gold Mining Company—A. K. Archibald, managing director. During this year a new 20-stamp mill was erected and 2,070 ounces of gold was extracted. The following year thirty men were employed and both the north and south leads were worked, but the ore was of lower grade than that which had been mined during the eighties, and that mined during subsequent years has also been a low-grade ore. In 1892 work was conducted under the management of H. Archibald, forty men were employed, and work was carried on principally in the second east shaft. Some crosscutting to the north was also done. In 1893, A. K. Archibald was manager and R. Irving underground manager. In 1894, the production fell off a great deal and returns were made for eight months only. Work ceased and the mine remained idle for three or four years, and no returns were made until 1899.

In 1897 the old Hattie property was worked a little and Geo. A. Irwin and others reported 60 ounces from 40 tons of ore.

The Montreal-London Gold and Silver Development Company, Limited, acquired the Dufferin mine in 1897 and an extensive and costly plant was erected. A building was completed with room for a 60-stamp mill and thirty stamps were put in. This was driven by steam power. For the treatment of the tailings three sets of hydrometric sizers and fifteen 6-foot Frue vanners were put in. Air compressors and an electric lighting plant formed a part of the entensive plant. Operations were carried on in 1898 under the management of Bernard McDonald, the old main shaft was enlarged and deepened, and a crosscut was driven south which intersected two auriferous slate belts. The company purposed sinking a vertical shaft to a depth of 1,000 feet and driving crosscut to intersect auriferous veins, from which the ore would be hoisted by the one shaft. This work was watched with keen interest by the gold miners of the province as being of such a character as to throw light on the problem whether a system of deep mining by vertical shafts and crosscuts could be profitably carried on. In 1898, the vertical shaft was started and carried to a depth of 260 feet. In 1899, 175 men were employed under the management of E. A. Daly, and 1,086 ounces of gold was extracted from 12,749 tons of ore. The vertical shaft was deepened to 300 feet, crosscuts were run at intervals north and south, four parallel leads of good size were struck and work was done on some of them. At a depth of 200 feet on No. 2 lead a level was driven 500 feet, and on No. 1 or the Slate lead, and on No. 3 lead levels were driven several hundred feet. At the 300-foot level No. 1 and No. 2 leads were also opened. During this year thirty more stamps and eight more Frue vanners were put in to treat the large body of ore opened up. In 1900, L. W. Getchell was manager and the vertical shaft was sunk 100 feet deeper. One hundred men were employed, levels were extended, some stoping was done, and 780 ounces were extracted from 6,600 tons of ore. In June the property was acquired by the J. Gordon Miller Mining and Milling Company and this company returned 247 ounces from 225 tons of ore. This year the Lake Eagle mine received some attention, and under the management of L. W. Getchell a vertical shaft was sunk to a depth of 185 feet and there was some drifting and crosscutting.

No returns were made in 1901, but in the summer of 1902 the Dufferin Mine Syndicate commenced testing the ore in the mine with a view to erecting a bromo-cyanide plant for treating the concentrates. Thirty stamps and twelve Frue vanners were kept running, but only 24 ounces of gold was returned from 749 tons of quartz. In 1903, a bromo-cyanide plant under the management of Mr. Maze was treating the old concentrates from the Dufferin mill and the first 44 tons treated yielded $15 per ton or 75 per cent of the gold content. Returns of 202 ounces of gold from 534 tons were made from this district in 1904. The mine was pumped out in 1905 for examination by Mr. Rickard, but was allowed to fill again.

In June, 1909, the Eagle Mining Syndicate—Munroe Archibald, manager—commenced operations on a 14-inch vein lying in a 4-foot slate belt in the western part of the district about half a mile from the main Dufferin works. This lead dips south at an angle of 53 degrees and carries arsenopyrite. The shaft is 50 feet deep and from the bottom, levels were driven east 54 feet and west 107 feet. From 143 tons of ore 97 ounces of gold was recovered in 1909 and from 236 tons 55 ounces was recovered in 1910. In 1928 the Maple Leaf Gold Mining Company erected a plant for mining and milling ore from a lead 12 inches wide in a 5-foot belt of slate 2 miles east of the Dufferin mine.

General Development

The great proportion of the gold produced by this district came from the first vein discovered, and the first company operated the north and south legs of this vein westward on the pitch of the fold for a length of 1,211 feet and eastward 577 feet, giving a total length worked of 1,788 feet, the stoped portion having an average depth of 120 feet and a maximum depth of 300 feet. Subsequently a vertical shaft was sunk 420 feet, and crosscuts run at depths of 134, 200, 315, and 420 feet developed a succession of veins, which do not outcrop at the surface and which have been worked above the 315-foot level. At the 400-foot level very little was done.

As has already been pointed out, the portion of the fold between the Dufferin and the Lake Eagle mines seems to offer a good field for the prospector. It is believed by some who worked on the upper saddle vein at the Dufferin mine that paying ore is still to be found on the east and west pitch of the saddle.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1883	3,885	19	19	7,602		10	5
1884	3,397	0	0	9,799		6	20
1885	4,924	0	0	10,880		9	0
1886	6,509	0	0	11,628		11	4
1887	3,258	0	0	10,602		6	3
1888	3,354	10	0	9,925		6	18
1889	2,032	14	0	7,633		5	7
1890	2,070	0	0	6,415		6	10
1891	1,406	0	0	5,210		5	9
1892	1,042	10	0	4,220		4	22
1893 (9 months ending Sept. 30)	882	0	0	3,220		5	11
1894 (year ending Sept. 30)	271	5	0	1,467		3	16
1899	1,086	4	2	12,749		1	16
1900	1,027	14	0	8,825		2	7
1909	97	0	0	143		13	13
1910	55	15	0	236		4	17
1925	1	10	0	22½		1	8
	35,301	1	21	110,576½			

SHERBROOKE OR GOLDENVILLE[1]

Location

Sherbrooke gold district lies in Guysborough county 2 miles west of the town of Sherbrooke and close to the northwest arm of St. Mary river. It is about 90 miles east of Halifax, from which city it is reached in the summer by steamer. It is also connected by daily stage with Antigonish, a town 40 miles distant on the Canadian National railway. It is frequently spoken of as Goldenville district from the name of the village that sprang up here on the discovery of gold.

Geology

The Goldenville formation is exposed here, in fact this formation is so named because of its exposure in this the most important gold district of the province. The anticline runs approximately north 75 degrees west (magnetic) and plunges to the west at angles varying from 0 degrees at the east to 30 degrees at the west. At the eastern end of the Bluenose property the strata are closely folded, run about parallel with the anticlinal axis, and curve sharply over the apex, quickly reaching a vertical and even an overturned dip on the south limb. Towards the west the fold becomes gradually broader, the outcrops of the strata form curves, and the vertical dip on the south limb is reached at a much greater distance from the axis. The fold is unsymmetrical and the strata on the north limb dip north at an angle of about 45 degrees.

---

[1] Plan in pocket.

Although the rock structure appears at first glance a simple anticlinal fold there are very important exceptions to its uniformity. Radiating from the main anticlinal axis are several subordinate gentle undulations which play an important part in the ore deposition. "Three[1] well-defined, transverse undulations have been traced on the north side of the saddle, the most easterly of which leaves the main Cobourg shaft near the anticline and runs north 65 degrees west (magnetic) to the shafts on the Gold Hill belt, then curving slightly to the north, it runs north 57 degrees west (magnetic)." The second undulation leaves the Mayflower belt on the anticline, and runs north 50 degrees west (magnetic) to and beyond the Hayden lead; the third passes about the McCrae vein.

In the east end of the district there are several small cross-faults, the two largest giving a horizontal displacement of 40 and 42 feet on the south side of the fold.

Character of the Deposits

The veins that have been worked all lie in the stratification planes, generally in belts of slate with walls of quartzite. Among those that have proved most productive are the following: Cobourg, Bunk, Wellington, Dewar, Blue, Zwickel or Jumbo, Little Hayden, McClure, and Harrison on the north; McNaughton, not outcropping, but discovered by crosscutting, Springfield, Wentworth, North, Canada, Etriker, Mayflower, Palmerston, and Meridian on the south. The size of these and of a great many other veins is given on the published plan. In some of the wide belts like the Palmerston and Meridian much of the slate lying between the quartz veins is more or less auriferous and a great proportion of the belt has been worked as a low-grade deposit either by open-cut or underground mining.

The district illustrates well the intimate relation existing between rock structure and the position and richness of the ore deposits. On the north side the enlargements of the veins and the pay-shoots are found to occur along well-defined lines corresponding with the lines of subordinate undulations radiating from the axis of the anticline, whereas between these undulations the veins become impoverished, narrow down, or pinch out altogether. Along the line of the most easterly of these undulations, which leaves the Cobourg shaft and runs to the shafts on the Gold Hill belt and then curves to the north running to the Gladstone, occurs a series of rich streaks. The depths to which some of these streaks had been worked on the incline in 1897 are as follows: Cobourg, 200 feet; Gold Hill, 75 feet; Bung, 280 feet; Wellington, 750 feet; Dewar, 400 feet; Cameron Whin, 100 feet; Blue, 300 feet; McKenzie, 150 feet; Zwickel Big, 300 feet; Gladstone, 140 feet; McClure, 300 feet; Harrison, 300 feet; Dougald Cameron, 60 feet; Dan McKenzie, 90 feet; and Wheel, 75 feet. On the second undulation, which runs north 50 degrees west (magnetic) from the Mayflower belt, pay-shoots have been worked on the following leads to the depths indicated; Mayflower, Root Hog, and John R., 90 feet; Murray, Serpent, and Bailey, 130 feet; Old Hayden, 90 feet; Jumbo, 180 feet; and Little Hayden, 350 feet. Only a few veins have been opened on the west undulation passing about the McCrae vein.

On the south side of the main anticline the line of pay-shoots runs nearly parallel with the axis, receding from it at the west. Each vein is richest in that part where it has a straight course and nearly vertical dip, just near where it begins to curve towards the axis.

In general the shoots dip to the west with the plunge of the anticline, and some like those in the Wellington, Dewar, and Blue were especially well defined. These dipped west 35 degrees.

On the south side of the fold a line of pay-shoots runs south 35 degrees east (magnetic) from the Mayflower belt and includes the rich streaks worked on the big Palmerston and Meridian belts to a depth of 100 feet.

Developments at the Bluenose mine in the eastern part of the district show that underlying the veins exposed on the surface is a series of saddle veins which fold over the apex of the anticline and extend down each limb. These attain a large size on the apex, decrease until they assume a vertical attitude, and then so far as present developments show they diminish but little in size with depth. This underground work reveals a small, subordinate flexure on the north limb. Most of the veins intersected have proved auriferous and three of them, the McNaughton and the Dunstan on the south dip and the Cantley on the north dip, were worked. The McNaughton belt has been shown by underground workings to vary from 6 feet thick on the 460-foot level to 8 feet 10 inches, where it begins to curve over the apex of the fold. It is composed of large, irregular quartz rolls and stringers pitching west 15 degrees to 22 degrees in slate interbedded with a few thin layers of quartzite.

---

[1] Faribault, E. R.: Geol. Surv., Canada, vol. X, pt. A, p. 108.

History

This district may without doubt be regarded as the most important district of the province, its total production having greatly exceeded that of any other. One of the earliest discovered, it rose almost immediately to the rank of an important producer and for twenty years continued to make large returns, several years exceeding 7,000 ounces, and one year, 1867, reaching the highwater mark of 9,463 ounces. The district passed through a period of comparative quiescence during the eighties and early nineties, after which it again became the scene of renewed mining activity and rose to the first rank among the producing districts.

The discovery of gold in this district is described by the Chief Gold Commissioner for 1862, as follows:

"In the summer of 1861, Nelson Nickerson of Sherbrooke, having by a visit to Tangier gained the information necessary to enable him to distinguish quartz from other rocks, returned home, and, while engaged in making hay in a small meadow about a mile and a half west of the northwest arm of St. Mary river, noticed the quartz rocks scattered over the land in different places, which had become exposed to view by the action of extensive fires that had raged through the forests at different times within the previous twenty years. By examining and breaking quartz he found gold, and was so much encouraged by the quantity thus obtained, that it became the principal business of himself and family for some time, which, however, they managed to keep secret.

About the first of October his neighbours began to suspect that he was obtaining the precious metal somewhere in the forest. He and his family were closely watched in their movements, from that time until about the fifteenth of the month, when he was discovered by the sound of his hammer. On the 18th of October, 1861, when this fact became generally known, over two hundred assembled on the ground who on that day, as is generally supposed, obtained gold by breaking quartz, to the amount of $400 worth."

A surveyor was sent in, areas were laid off, prospecting was vigorously carried on, and soon the district was a live and energetic mining camp. In 1862, over 2,000 ounces were produced and the following table gives the principal veins mined that year, the depth to which each was mined, and the maximum and average yield per ton.

Lead	Depth	Maximum yield per ton	Average yield per ton
	Feet	Ozs.	Ozs.
Cumminger	20	2¼	1¼
Aikens	30	7	1½
Hayden	30	7	3½
Drysdale	30	8	2¾
McKay	32	7	4¼
Blue	40	9½	4¾
Hewitt	60	12	4

The years 1863, 1864, and 1865 saw an increased production, but a decrease in the yield per ton. This was due to the crushing of a certain amount of alluvium and portions of the slate belts adjacent to the veins, so that although the yield per ton crushed was not so great the average yield per man employed was considerably greater. In 1866, the mines were worked with still greater profit and with increased activity. The Cumminger lode, which dipped north 45 degrees and is probably the one indicated on the plan as the Wellington lode, was worked by Messrs. Cumminger and Company, who sank three shafts, the most easterly 87 feet deep, the middle 122 feet, and the westerly 200 feet. Much of the lode between these shafts was stoped. On the adjoining area to the north the New York and Sherbrooke Company started a shaft with the intention of cutting the Cumminger lead at a depth of 200 feet; the Wellington Company sank two shafts on this lead to the west of the Cumminger mine, the eastern one being 200 feet deep and the western 74 feet deep. On the Blue lode, about 500 feet north of the Cumminger, the Grape Vine Company had a shaft 278 feet deep and stoping was carried on at the 150-foot level on the east and below the 213-foot level on the west. A 2-inch lode lying south of the Blue lode was worked by Messrs. Bayne and Hayden and by the New York and Sherbrooke Company. Two shafts were also sunk on the Palmerston lode by Messrs. McClure and Company, and one by Messrs. Cumminger and Company. The lode was found to consist really of two lodes 3 and 4 inches thick with over 3 feet of intervening slate.

In 1867, the district made its highest production—9,463 ounces. Work was brisk. The Palmerston lodes were worked by the Dominion Company, the Metropolitan Company, and Messrs. McClure and Company. Two shafts were also sunk by the Dominion Company on the Hewitt lode. The Wellington Company continued sinking on the Cumminger lode and stoping; and Messrs. Hayden and Derby still worked the lode south of the Blue lode. The New York and Sherbrooke Company sank two shafts on a lode 150 feet north of the old Hayden lode, and farther west on the same lode a shaft was sunk by Messrs. Hayden and Derby.

In 1868, five new crushers were erected and in most of the mines work was steadily pursued. The Wellington Company's main shaft on the Cumminger lode was 280 feet deep and from it stoping was carried 250 feet to the east and 100 feet to the west. This company also had two shafts on the Dewar lead, about 100 feet to the north. Work was continued on the Hayden and Derby lode and ore was hoisted by a 110-foot shaft. The New York and Sherbrooke Company being unable to cope with the water entering its mine suspended operations in October. South of this company's property a lode showing 18 inches of quartz along with 18 inches of slate was opened by the Delta Company. This lode shows a bend in the strike of the rock and dips westerly. On the adjoining property the Crescent Company opened three shafts. The principal operations of the Dominion Company were confined to the Palmerston belt from which a body of ore 20 feet wide and 80 feet long was removed by underhand stoping. The same company worked the Hewitt lode also for a short time during the early part of the year. The Palmerston belt was also worked during the greater part of the year by the Palmerston Company, who sank two shafts on a lode lying to the north of the Palmerston. The Metropolitan Company did a limited amount of work on the Palmerston belt, but its chief operations consisted of the sinking of two shafts, one on the Hewitt lode and one on the Archibald lode about 20 feet south of the Palmerston. A crosscut was also driven from the Hewitt to the Palmerston. The Kingston and Sherbrooke Company sank a 35-foot shaft on the Cumminger lode about 600 feet east of the Wellington Company's No. 1 shaft, one on the Dewar lode, and a shaft on each of two lodes considerably to the south of this part of their property. Still farther south five shafts were sunk on different lodes by the Meridian Company. One 60 feet deep was sunk on the Sears lode on which levels were driven, one on a lode 50 feet to the south containing three veins of quartz in a thickness of 3½ feet, one on a 2-inch lode 80 feet farther south, and one 120 feet still farther south on a lode containing three veins of quartz. Adjoining the property of the Meridian Company on the east was that of the Chicago Company by whom six shafts were started; to the east also lay the property of the Canada Company by whom a 50-foot shaft was sunk on the Dr. Hea lead. Shafts were also sunk by this company on a lode to the south of this. The Wentworth Company sank two shafts on the Ferguson lode, one on a 22-inch lode to the north and another on a lode 70 feet south. On the adjoining property to the north a 60-foot shaft was sunk by the Cobourg Company on a 12-inch lode. The properties of the Caledonia Company and the Woodbine Company lay still farther east and the former company sank on a lode 28 to 35 inches wide, and the latter opened the Woodbine lode by three shafts. All the companies in the eastern part of the district started operations this year, and of these the Meridian, the Wentworth, and the Canada erected 15-stamp mills.

In 1869, there were nineteen companies operating in this district. At most of the older workings mining was actively pursued, but some of the properties that were opened for the first time, 1868, did not receive a great deal of attention. The Wellington Company deepened its west shaft on the Cumminger lode to 330 feet and its shafts on the Dewar lode to 75 feet. Some work was done by this company on the Hayden and Derby lode, and from a lode 4 feet north of the Hayden lode a crosscut was driven 150 feet to the north. On the property adjoining that of the Wellington Company two 90-foot shafts were sunk on the Dewar lode by the Rockville Company. The work of the New York and Sherbrooke Company was chiefly of an exploratory character and several new lodes were exposed. The operations of the Delta Company were discontinued after the shafts had been deepened somewhat, and some crosscutting and a little stoping had been done. Similar work was done by the Crescent Company, but after February work was almost suspended. The Stanley Company opened some lodes, three of which dipped slightly to the south and one to the north, but work on these also was suspended. The Palmerston belt received a large measure of attention and a large amount of ore was stoped out by the Dominion Company, the Palmerston Company, and the Metropolitan Company. The last-named company did considerable stoping on the Archibald lead and from the Hewitt lead drove a crosscut 80 feet south. On the Kingston and Sherbrooke Company's property nothing was done except the deepening of the two shafts to about 75 feet. The work of the Meridian Company was confined to the Striker lode, which was cut in a crosscut from the Sears lode. The Chicago Company did some stoping on the Sears lode, drove a crosscut south 60 feet and north 65 feet, and in a vein, cut 24 feet to the north, drove levels and stoped out a block of ore. The same company opened the Ferguson lode about 150 feet farther north. The operations of the Canada Company were also limited. There was some sinking and stoping on the Milroy lode, together with a little crosscutting, and some sinking on a large lode 200 feet south of the Dr. Hea lode. Work was carried on by the Wentworth Company on the Cartwright lode, the Ferguson lode, and a lode farther south. The Cobourg Company extended its shaft to a depth of 130 feet. The Woodbine Company hoisted ore from the Woodbine lead by three shafts, 76, 45, and 31 feet deep, and on the Blakie lead 15 feet to the north of the Woodbine two shafts were operated. The Caledonia Company sank on the Blakie lead and drove 75 feet south without cutting any lead of importance. To the southeast of these operations a 12-inch lode was discovered by Mr. McKinnon, some open-cutting was done, and a shaft was sunk.

In 1870 over 7,000 ounces of gold was returned and of this over 6,000 ounces were produced by four companies, the Wellington, Dominion, New York and Sherbrooke, and Palmerston Companies. The Wellington Company continued to mine the Cumminger and Dewar lodes. On the former the main shaft was carried to a depth of 400 feet and the length of the stoping was 220 feet, 60 feet of which extended east of the shaft. On the Dewar lode the stoping ground was 200 feet long and the shaft 110 feet deep. This company recovered this year 2,162 ounces of gold from 2,698 tons of ore. The New York and Sherbrooke Company continued to mine the lodes opened in 1869 and other lodes in the vicinity, and several shafts were sunk. On the adjoining property to the east Mr. McDaniel opened several veins. A shaft was sunk 120 feet deep on the Harrison lead, one 120 feet deep on a lode 30 feet to the north of the Harrison lode, and one on another lode 30 feet farther north. A shaft 110 feet deep was also sunk on the Sutherland lode about 500 feet south of the Harrison lode, and west of the shaft this lode was found to turn abruptly to the south and unite with an aggregation of irregular quartz masses. The principal operations on the Palmerston belt were those of the Dominion Company. Stoping was conducted on this belt and on an 8-foot belt opened by a crosscut 18 feet to the north. The Palmerston Company sank a shaft 110 feet to test the Palmerston lode below the known pay-shoot, but little gold was found. A lode 14 feet to the north of the Palmerston was opened by crosscut and mined considerably, and two shafts were sunk on a lode 70 feet north of the Palmerston. East of this point Mr. Cleverdon worked the Sears and Striker lodes, but many of the properties were closed or had changed hands. The Ferguson lode, which had been opened by the Wentworth Company, was mined by the Hamilton Company. The same lode was worked on the Caledonia Company's property by Mr. Twist, and the Chicago Company worked a lode lying to the north of the Sears.

In 1871, five mines were worked the year around, the Wellington, the New York and Sherbrooke, the Dominion, the Palmerston, and a small mine worked by Messrs. McClure and Snow; in August and September as many as eighteen mines were worked. The principal returns were made by six companies as follows:

—	Ore crushed	Gold recovered
	Tons	Ounces
Wellington	2,095	1,385
Sherbrooke	1,698	1,696
Dominion	2,580	637
Palmerston	4,048	805
Caledonia	367	502
Wentworth	2,542	736

The Wellington Company's workings on the Cumminger lode were extended to a depth of 480 feet and on the Dewar to 170 feet. The New York and Sherbrooke Company worked for a while on the McDaniel and Sutherland lodes, but its principal operations were on the north lode, where the shaft was deepened to 200 feet, and the Harrison lode, where the shaft was deepened to 210 feet. The Palmerston Company worked the same lodes as in 1870, continuing the shaft on the Palmerston lode to a depth of 120 feet. Shafts were also sunk on the Striker lode and levels driven, and two shafts were started on the Snow lode 100 feet north of the Striker. The Dominion Company worked the Palmerston, but suspended operations at the end of the year. The Caledonia Company discontinued work on the Ferguson lode, but opened the Caledonia or Wilson lode about 20 feet north of the former. The Meridian Company resumed operations on the Striker lode and shafts were sunk 120 and 115 feet. The Hamilton Company continued to work the Ferguson lode, removing the ore by overhand stoping; they also made an open-cut 160 feet long and 32 feet deep on the Caledonia or Wilson lode. The crosscut from the west shaft to the Ferguson lode was extended north to a length of 120 feet. There was some prospecting during the year and James McDonald made an open-cut 150 feet long and 23 feet deep on a lode discovered north of the Wellington.

In 1872 there was quite a little tributing and the production fell to 4,188 ounces, although much richer ore was crushed. The mining which had been carried on continuously for a number of years on the Wellington lead was discontinued in August when the shaft had reached a depth of 500 feet and it was found that the machinery on the ground was insufficient to carry on mining profitably at a greater depth. The Dewar lead on both the Wellington and Rockville properties was worked by tributers, and the same lead farther east on the Rochester and Try Again properties was reopened by tributers after several years of idleness. The McLean or Little lead on the Wellington and Alexander properties and the Archibald lead on the latter property were also reopened by tributers after lying idle for several years. The Palmerston Company ceased work and let its property to tributers, who sank two shafts 40 feet deep on a 14-inch lead which they had discovered 18 feet south of the Snow lead. The Meridian Company, after working the Striker lead for the greater part of the year, turned their attention to prospecting for the new lead found on the Palmerston property, and search was also made for it by the British Company on the Cleverdon property. Operations ceased on the property of the Caledonia Company, and the Hamilton Company also suspended operations after sinking on a small abandoned lead 150 feet north of the Ferguson lead and finding it too small to be worked with profit. The New York and Sherbrooke property was worked on tribute by Israel West, who employed on an average twenty-one men on the Harrison or South lead, on which he deepened the main shaft to 250 feet. He also prospected the Hayden and Derby property and in September discovered a promising lead.

There was an increase in production in 1873 and the principal workings were on the Dewar lode on areas 651 and 652. On the New York and Sherbrooke property work was discontinued in August, but on the Hayden and Derby property adjoining it on the south Mr. West continued operations on the lead opened in 1872, carrying stopes 150 feet long to a depth of 90 feet. The new lead discovered on area 747 on the Palmerston property in 1872 was mined, and its extension on areas 749 and 750 was also worked. Some tributing was also done on the Striker lead and on the Canada and Caledonia properties.

The year 1874 was rather dull. Mr. West ceased work on the lead on the Hayden and Derby property, and work on the Dewar lode on the Try Again property and for a time on the Rochester property also ceased. The Dewar on areas 620, 621, 622, and 623, block 3, however, continued to be mined. The tributers working on the Palmerston property also mined the extension of the South lead of the Dominion property. Areas 748 and 749, block 3, were profitably worked and mining was carried on on the extension of the same belt on areas 750 and 751 on what was thought to be the Striker lead. This year some new leads were discovered and tested and some old ones reopened. Mr. Zwickel did some work on areas 614 and 615, block 5. New machinery was erected on the Wellington lead, and the 500-foot shaft, the deepest shaft in the province at that time, was pumped out.

The year 1875 saw a marked revival of industry in this district due to the reopening of the Wellington mine. The production was 5,818 ounces from 6,443 tons and of this over 3,000 ounces were taken by the Wellington Company from areas 620, 621, and 622, block 3. The main shaft on the Wellington lead was opened and as the pay-shoot lay to the west of the shaft and pitched in that direction it was got at by means of an incline. The Dewar lode on which the western shaft was 356 feet deep was also worked, and as the workings, extending 400 feet to the east, were drained the Rockville property adjoining on the east was also drained and was consequently reopened. Mr. Zwickel made use of the old machinery on the Grapevine property to open a lead that he called the McClure lead on areas 614 and 615, block 3, and another small lead 40 feet to the south of it. The South lead on the Dominion property was worked until August, and on the Palmerston property until the end of the year. The same lead was also worked on the Meridian property to a depth of 120 feet, and 140 feet along the lead. Mr. Cleverdon did some work on the Striker lead on the property of the British Company and tributers did some work on the Sears lead, besides taking out the upper parts of the leads on the Chicago property.

In 1876, the Wellington was still the principal mine and stoping was carried on by both the overhand and underhand systems. The lead averaged 18 inches, but in places swelled to a thickness of 24 inches. Work on the Dewar lead was also carried on and it continued to exhibit its alternately rich and poor horisontal streaks with marked regularity. On the Grapevine property, Mr. Zwickel continued working the McClure lead to a depth of 130 feet, when it was abandoned as unprofitable, being only 1½ inches thick and decreasing in yield from 4 ounces to 7 pennyweights per ton. The Middle lead 40 feet to the south was also abandoned and one 40 feet farther south was opened and christened the Big lead. This gave good returns and was also opened on areas 616 and 617. On the Alexander property a vein supposed to be the Murray and in line with the Dewar was opened by Mr. McEachren. Work on a small scale was conducted on the Palmerston and Dominion properties and on the Striker lead and the one immediately to the north on the Chicago property.

The year 1877 was second only to 1867 in production, and 8,237 ounces of gold was recovered from 8,654 tons of ore. Regular work was conducted on the Wellington and Dewar lodes and another lode half-way between the two was opened and yielded over one ounce per ton. The shaft on the Dewar was deepened to 420 feet and stoping on the Wellington was carried 300 feet west of the shaft. The Murray lead on the Alexander property was abandoned and the tributers who reopened the Dewar on the Try Again property found it too small to be worked with profit, for although it yielded 1½ ounces it was only ½ inch thick. On the Grapevine property the south lead was worked, but at a depth of 140 feet it was only 8 inches thick, whereas at the surface it was 20 inches. The Middle lead received some attention and was also mined on areas 616 and 617. Some little work was done on a lead discovered on area 631, block 4, which promised well, but was unprofitable on area 661, block 3. The discovery of some rich ore by Mr. Fraser on area 778 of the Dominion property led to renewed activity in this quarter of the district, but some of the operators did not meet with the success they had expected.

In 1878, the Wellington mine was again closed after stopes had been extended west of the shaft 300 feet and 180 feet below the bottom of the 500-foot shaft. The Dewar, however, continued a producer and its shaft was deepened to 480 feet, and the Middle lead also gave satisfactory results. This year the Blue lead, on which a 300-foot shaft had previously been sunk, was reopened. The Middle lead on area 614 was mined by Mr. Zwickel and its extension by the Gladstone Company. The Harrison lead on the Hayden and Derby property was reopened, and in the southern part of the district small blocks of ore were taken out on tribute.

In 1879, work was continued on the Dewar and Middle lodes and on a new lode 45 feet south of the old Wellington. A big lode on the Wentworth property was worked by Mr. Hattie and on the Caledonia property by Mr. McNab. Messrs. Bent and Fraser stoped some good ore from the Dominion property, and tribute work was done on the Hayden and Derby, Gladstone, Chicago, New York, and other properties.

In 1880, work on the Dewar lead was progressing and the shaft was said to be 550 feet deep. A shaft was also sunk 100 feet on the Murray lode north of the Dewar. Work ceased on the Grapevine property in May, but on the Dominion property, Messrs. Bent and Fraser continued on the lode they were working the preceding year. The New York, Hayden and Derby, Rochester, and Kingston properties received considerable attention.

The production of 1881 was much lower than that of the preceding year. The Dewar was still worked to the west of the shaft and there was talk of reopening the Wellington. The large belt on the Palmerston property was reopened by Mr. Fraser with the intention of milling a great quantity of low-grade ore. Messrs. Hattie and McNab continued at work on the leads they were mining the preceding year and John Williams did some work on the Gladstone property.

In 1882, some new lodes were tested on the Wellington property, and tributers worked on the Hayden and Derby property. On the Palmerston property the wide low-grade belt was mined, a tramway was constructed from the mine to the mill, and a consolidation of the Palmerston and several adjoining properties was effected under the name of the Pactolus Gold Mining Company.

This company was the principal operator in 1883, and the belt was extensively mined. On the Hayden and Derby property, on the Rockville, as well as on the Cleverdon and other properties, operations were carried on. On the Meridian property, Mr. Hamilton mined a 7-foot belt from which in 1882, 3,300 tons of ore had given an average yield of 6 pennyweights 3 grains.

In 1884, the Pactolus Gold Mining Company allowed the large belt to fill with water, but worked a small lead on the Rockville property. The extension of this lead on the Gold Hill property was worked by D. R. Cameron. One of the best paid operators was Mr. Williams, who worked the Hayden and Derby and the New York properties. Some work was done on the Alexandria and the Dominion areas and on the Caledonia areas by Messrs. McNab and Sinclair. A new lode opened on the Wellington property north of the Dewar did not come up to expectations.

In 1885, the production fell to less than half that of the preceding year. Some work was done on the New York and Sherbrooke areas by Mr. Williams, on the Meridian areas by G. May, and on the Caledonia and Alexandria areas by Messrs. Brown, McNab, and others. On the Pactolus areas the ground was tested to the west of the open-cut, and Mr. Cameron opened a small lead north of the Wellington. The following year, Mr. Williams was still at work on the New York and Sherbrooke areas; several leads on the Wellington areas were tested; the Pactolus open-cut received some attention, and other properties in the district were worked more or less.

In 1887, the production fell to less than 600 ounces. J. Williams and Company worked on the Palmerston, New York, and Hayden properties, and work of a limited nature was done on the properties of the Dominion, and Canada Companies. Among those who were engaged in operations may be mentioned Messrs. McLean, Fraser, McKay, Purcell, Jack, and McDonald.

For a number of years mining in this district was not very brisk and returns were small. In 1888 and 1889, James H. McDonald crushed a lot of low-grade ore from the Mayflower belt and areas adjoining it on the north, and during the latter year Mr. Williams made preparations to mine low-grade ore on a property adjoining the Palmerston, and Robert McNaughton met with encouragement in developing a property in the eastern end of the district. In spite of these preparations the returns for 1890 to 1893, inclusive, were very small.

In 1894, there was a renewal of interest in this district which led to a very marked increase in the production for a number of years. Some tributing was done, but the principal returns were made by the Stellarton Gold Mining Company, Limited, which was incorporated this year. Under the management of John McQuarrie, the old Wentworth property was re-opened. In addition to this, work was started by the Springfield Gold Mining Company under the management of R. McNaughton and prospects were very promising.

Three companies were at work during portions of the year 1895; the Springfield Gold Mining Company, A. J. McNaughton, manager; the Stellarton Gold Mining Company, Limited, John McQuarrie, manager; and the New Glasgow Gold Mining Company, Limited, J. A. Fraser, manager. By the first of these, twenty men were employed on the Springfield and North belts; by the second, the Wentworth and another 9-inch lead were worked; and by the last, the Sears, Striker, Canada, and North leads were re-opened.

In 1896, the returns made by the Stellarton Company were small, but mining was brisk on the New Glasgow Company's property. Here forty-five men were employed, and ore was stoped from the lodes re-opened the preceding year, and crushed at a 10-stamp mill. During this year the Blue Nose Gold Mining Company, Limited, was incorporated to take over and mine the Springfield, Caledonia, Woodbine, and Cobourg properties. Under the management of A. G. McNaughton, work was pushed, thirty-two men were employed, a new 20-stamp mill was erected, two leads on the Springfield property were worked, and work was started on the Caledonia and Cobourg properties.

In 1897, the Blue Nose Company under the management of A. G. McNaughton had sixty men employed and a large quantity of ore was taken from the Springfield belt, the South belt, and the Cobourg lead. The New Glasgow Company had forty-five men employed and mined the North and Canada leads. George Hirschfield had twenty men at work on the North lead and made good returns. Work was started this year by the Sutherland Development Company under the management of George Brackett. A new 10-stamp mill was erected and shafts were started on the 8-inch State lead and on the Murray lead. Other leads which had been opened on the property were the 8-inch Brazen Serpent and the John R. belt with 3½ feet of crushing ore.

In 1898, the Blue Nose property made much the largest returns. Ore was hoisted from the South belt by means of a 200-foot shaft and from the Springfield belt by a 250-foot shaft. Work was conducted under the same management on the Striker and Canada leads on the New Glasgow property, and on the former the shaft was sunk to a depth of 165 feet and on the latter two shafts were sunk nearly 200 feet. George Hirschfield had twenty-five men employed for the Palmerston Gold Mining Company, on the Palmerston lead, and the Sutherland Development Company mined the Brazen Serpent lead.

In 1899, the Blue Nose Gold Mining Company continued active operations on the two belts and returned 3,080 ounces of gold from 8,957 tons of ore. The New Glasgow Gold Mining Company conducted operations on the Striker and Canada leads under the management of G. A. Hirschfield. A test lot was also taken from the little Palmerston shaft and the Meridian lead was opened. In this year the Royal Oak Mining Company, Limited, was incorporated, and under the management of W. J. McIntosh the shaft on the Gladstone property was pumped out and preparations were made for erecting a new 10-stamp mill.

In 1900, the Blue Nose Company had sixty men employed under the management of A. G. McNaughton, and recovered 4,588 ounces of gold from 14,316 tons of ore. The main shaft was 400 feet deep and crosscuts were driven north from 20 to 150 feet long in which a number of veins were intersected. Ten more stamps were added to the mill and a Wilfley concentrator was put in. At the Royal Oak mine, the shaft on the Zwickel Big lead was found to be 200 feet deep and it was extended 200 feet deeper. A crosscut was driven south, which cut the McKenzie lead and one to the north also to get the Gladstone lead. The Stuart-Hardman and New Glasgow properties were taken over by the Union Development Company and development work was started under the management of N. Nopping. Ten stamps were added to the New Glasgow mill; the old Wellington shaft was unwatered for 200 feet; and a large, two-compartment vertical shaft was started near the west end of the Palmerston property. Work was suspended, however, in February owing to litigation.

In 1901, mining was continued at the Blue Nose, and a large quantity of low-grade ore was treated, so that the great proportion of the gold reported from this district was from this mine. At the Royal Oak mine the crosscut to the north was driven far enough to intersect the Gladstone and McClure leads, some overhand stoping was done on the Zwickel Big lead, but the principal work was done on the Gladstone lead about 700 feet farther west. Some tributing was done this year on the Meridian lead.

During 1902, little work was done at the Blue Nose mine on the Springfield belt and operations were almost wholly confined to belts that were opened up by crosscuts driven to the north at the 280 and 360-foot levels. Three of these belts not outcropping at the surface were named the Cantley, the Fraser, and the McNaughton. The last one was the most important and operations on it were quite extensive. This year the Royal Oak mine rose to the rank of an important producer, and some sixty men were employed. The deep shaft on the Big lead was abandoned and active operations were conducted farther west. The shaft on the Jumbo lead was deepened to 215 feet, levels were driven, a crosscut was driven north to the Little Hayden lead; and on the Hayden belt to the south a shaft was started to meet a raise from the end of a crosscut from the Jumbo workings. Some ore was removed also from this south Hayden lead. Preparations were made to put in ten more stamps, thus making the mill a 20-stamp mill.

Extensive operations were carried on in 1903 at the Blue Nose and the Royal Oak mines. The main shaft on the Springfield belt was deepened to 470 feet and another crosscut was driven north to the McNaughton belt on which new levels were driven, the old ones extended, and a great deal of stoping done. The old Wentworth workings were also re-opened by the Blue Nose Company who purposed sinking and driving east under the old workings to strike a rich roll pitching west from its outcrop at the east. Work was continued on the Jumbo lead by the Royal Oak Company under the management of W. J. McIntosh. The shaft was deepened to 320 feet, blocks of ore were stoped, and crosscuts were driven to the Hayden lead from which a considerable quantity of ore was taken. Exploratory work was also prosecuted on the McKenzie lead and another belt to the north. This year, Geo. W. Stuart continued the vertical shaft, 14½ feet by 4½ feet, to exploit the ground west of area 743, the intention being to crosscut south at the 160-foot level and work the Palmerston and other belts. At the time of the inspector's visit the shaft was 123 feet deep and operations were in progress.

The production for 1904 was much less than half that of 1903. Work was continued at the Royal Oak mine, but the returns were small. Some work was done on the Jumbo and Hayden leads and on the Gladstone lead where the old 420-foot shaft was pumped out and repaired. The old Zwickel shaft 300 feet east on the same lead was also pumped out. The Blue Nose mine produced 431 ounces of gold from 3,200 tons of ore, but it was not worked continuously and was closed some time during the year. Development work was continued by the Nova Scotia and Mexican Mining Company—Geo. J. Troop, manager—and the vertical shaft sunk the preceding year by Geo. W. Stuart was continued to a depth of 260 feet. At the 160-foot level a crosscut was driven north 206 feet and south 307 feet. At 70 feet north of the shaft a small lead supposed to be the North Palmerston was driven on for a short distance. Other veins were cut to the north at 98 feet, 115 feet, and 146 feet from the shaft and on the last, which was thought to be the Mayflower belt, levels were driven 225 feet east and 97 feet west. In the crosscut to the south the Tributer vein was struck at 54 feet, the Stuart belt, 19 feet wide, at 72 feet, and the Hard belt at 97 feet. Some little work was done on the Tributer vein, and the whole width of the Stuart belt was opened 48 feet east and 28 feet west. At the 260-foot level a second crosscut was driven 110 feet south. A 40-stamp mill was erected and over 1,000 tons of ore crushed yielding 71 ounces of gold.

The mine of this company was full of water at the time of the inspector's visit in 1905, although for this year returns of 427 ounces of gold from 2,665 tons of ore were made. During the winter the company had constructed a plant for developing water-power at Liscomb Falls, had cut out a line and put up poles for electric transmission of power to Goldenville, a distance of 7 miles. The Royal Oak Mining Company under the management of Col. Evans continued work on the Zwickel Big lead at a depth of 400 feet. On the 400-foot level a crosscut was driven south 80 feet to the

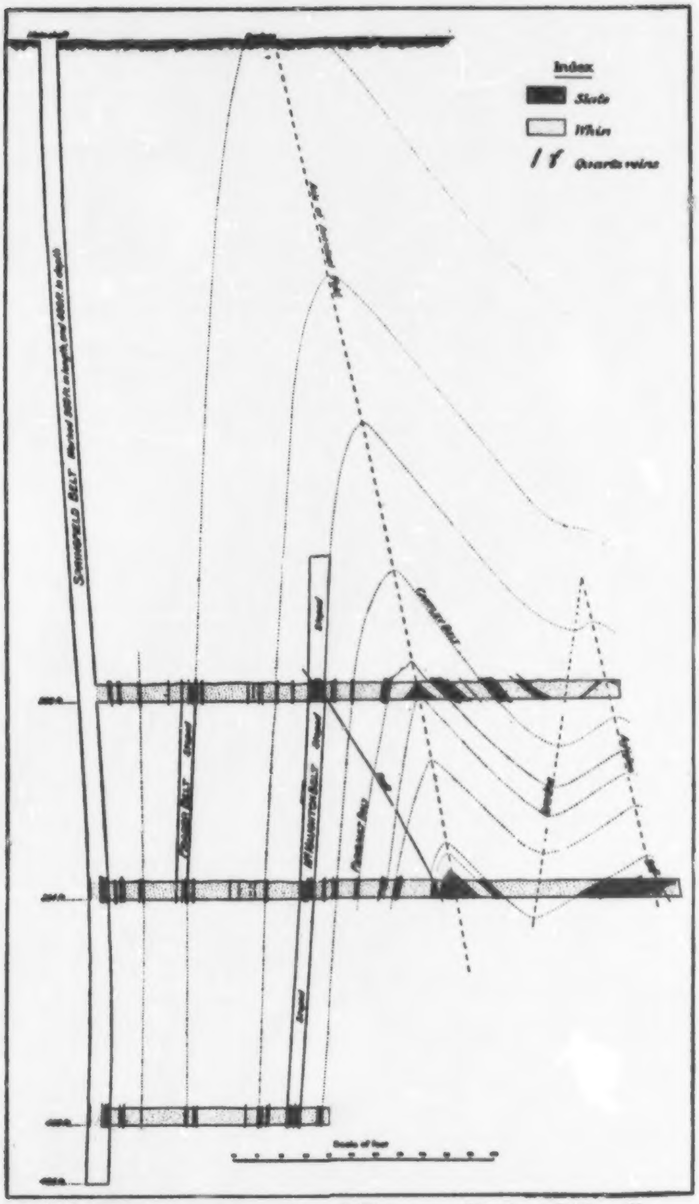
Index
Slate
Whin
Quartz veins
Springfield Belt
Stoped
Scale of feet

Figure 6. Transverse section of Bluenose gold mine, Goldenville.

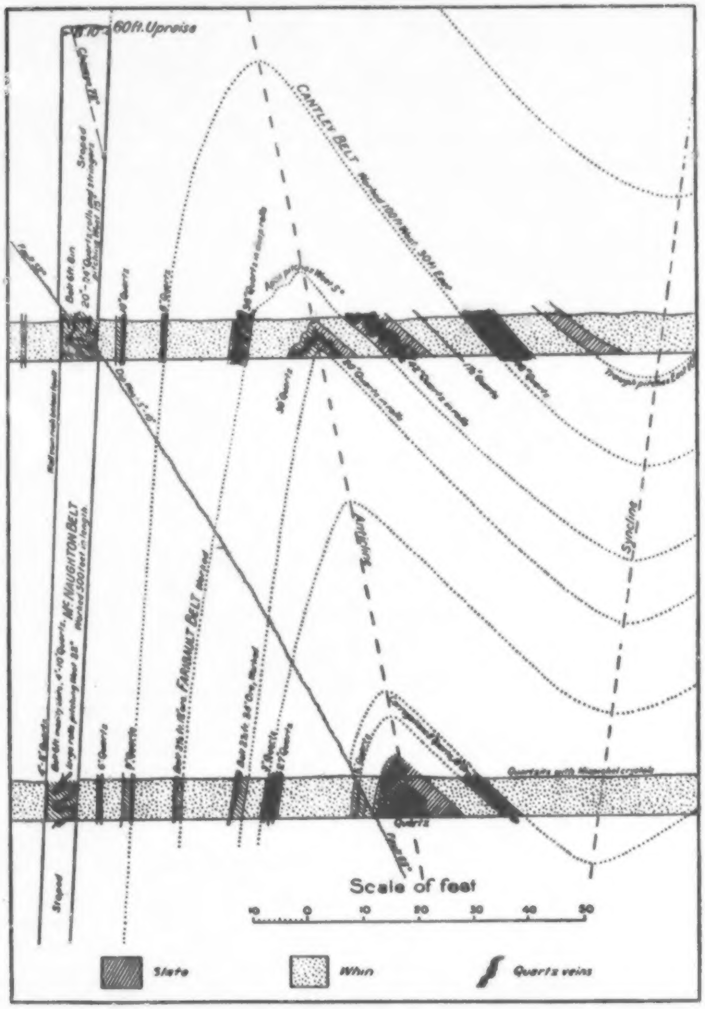
60ft. Upraise
Stoped
CANTLEY BELT
MᶜNAUGHTON BELT
Worked 500 feet in length
FARNAULT BELT worked
Syncline
Quartz
Scale of feet
10
0
10
20
30
40
50
Slate
Whin
Quartz veins

Figure 7. Detailed transverse section of the 280 and 364-foot levels of the Bluenose gold mine, Goldenville.

Blue lead, cutting the McKenzie belt at 33 feet south of the Zwickel. A level was driven east on the Blue lead in which the pay-shoot was struck and was stoped. This company recovered 222 ounces of gold from 283 tons of ore in 1906, but since then no returns have been made except a small amount in 1909 by Geo. A. Hirschfield who crushed 61 tons of ore, yielding 22 ounces, from a small lead on the Neilly property on or about area 720.

In 1910 tribute work by George Hirschfield resulted in 169 tons of ore mined and crushed, yielding 76 ounces gold. In 1912 the Goldenville Mining Company acquired the property and rights of the Mexican Mining Company and commenced installation of a hydro-electric station at the falls upon Liscomb river for generation of power to be transmitted to Goldenville for operation of the mines. Operations were carried on by this company during 1912 and 1913 under the management of A. C. McNaughton and during 1914 to 1916 under the management of R. V. Neilly. The shaft on the Wellington lead was partly unwatered and a small amount of work done in the way of drifting and crosscutting and testing the veins cut, but the greater part of the work was on leads met in the crosscuts run on the 160-foot level north and south from the Stuart shaft sunk several years previously on the Palmerston lead.

On the Stuart or Big South belt, which lies 70 feet south of the shaft, levels were driven 240 feet east and 190 feet west and considerable stoping done. On the Sears lead, which lies 30 feet north of the shaft and to which three crosscuts were driven from the Striker lead on the north, levels were driven to a total length of 425 feet. The Warren belt lying 50 feet south of the shaft was reached by a crosscut driven south from the Striker lead at a point 350 feet east of the main crosscut and a small amount of work done on it. The Canada lead, which lies 135 feet north of the shaft, was opened by levels driven 250 feet east and 125 feet west. The greater part of the ore mined came from the Striker lead. Drifts were carried east to a total length of 970 feet and west 265 feet and the ore above the 160-foot level stoped.

In 1914 the Goldenville Gold Mining Company obtained a yield of 896 ounces of gold from 6,806 tons of ore; in 1915, 2,125 ounces from 19,093 tons; in 1916, 1,223 ounces from 14,711 tons; in 1917, 276 ounces from 4,185 tons.

The Goldenville Consolidated Mining Company in 1918 drifted on the Dewar lead west 150 feet from a crosscut from the shaft on the Wellington lead and stoped 40 feet of vein above this level. The production for this year was 363 ounces from 573 tons of ore.

In 1919 the Sherbrooke Mines and Power Company cleaned an old shaft on the Murray lead. At the 100-foot level a drift that had been run 40 feet west was carried 406 feet farther and a drift that had been run 85 feet east was carried 150 feet farther. It is said that the level passed through a westerly dipping ore-shoot carrying $11 a ton, but that the rest of the vein is very low grade. A crosscut from the Murray lead to the Cameron whin belt and a raise on this belt gave unsatisfactory results. The Wellington shaft was carried to a total depth of 555 feet, and a crosscut was driven south 125 feet on the 160-foot level from a point 60 feet east of the shaft cutting the John Williams and Bung leads. From a point 177 feet west of the shaft on the 300-foot level a crosscut was driven north. In 1920 levels were driven from 25 to 50 feet on the John Williams, Slate, Big Mundie, and Bung leads that were cut on the crosscut driven south from the Wellington lead, but the rock was found to be very low grade. A yield of 37 ounces was obtained from 858 tons.

The company directed its efforts in 1921 to 1924 to the leads reached by the Stuart shaft on the south limb of the anticline, and in 1925 and 1926 work on these leads was continued by the Consolidated Mines and Power Company. The shaft was cleaned to the 260-foot level and work was carried on at this depth. Crosscuts were driven south 117 feet cutting the Stuart lead and north 230 feet cutting the Sears, Striker, Mayflower, and Canada leads. Levels were driven on the Stuart, Striker, Mayflower, and Canada leads, but most of the stoping was on the Striker lead, on which a level was driven a considerable distance east and a total length of 560 feet west. The production in 1921 was 75 ounces from 1,390 tons; in 1922, 354 ounces from 3,760 tons; in 1923, 237 ounces from 1,999 tons; in 1924, 173 ounces from 1,405 tons; in 1925, 1,179 ounces from 7,506 tons; and in 1926, 1,738 ounces from 6,797 tons. In 1927 ore was taken from the Stewart, McEachern, and Hewitt belts and 1,841 ounces of gold recovered from 14,055 tons. The arsenopyrite was recovered by concentration. In 1928 the Novamac Mines and Power Corporation, Limited, sank a winze from the 260-foot level on the Striker lead to the 400-foot level and a crosscut was started to connect this level with the vertical shaft.

General Development

The depth to which the different veins were worked is indicated on the published plan of the district for which the survey was made in 1897, and apart from this we have very little definite information regarding the extent of developments. A common method of removing the ore from the large belts on the south side of the anticline was the open-cut, whereas on the narrower leads on the north side numerous shafts were sunk on the dip of the lead and the ore stoped out between these. The zones of pay-shoots are clearly indicated by the locations of the workings. In very few cases did the shafts extend to more than 400 feet deep on the incline, and it may be that some of the pay-shoots have not been worked out.

An interesting piece of exploratory work[1] was done on the Blue Nose property. The Springfield belt was worked throughout a length of 900 feet and to a depth of 400 feet. It was believed that by crosscutting towards the anticlinal axis other auriferous veins might be found. Three crosscuts were, therefore, driven north from the Springfield belt at depths of 280, 364, and 460 feet and were carried respectively to lengths of 230, 250, and 290 feet. Several belts not exposed on the surface were cut. The most important of these, known as the McNaughton, was worked about 900 feet in length and 245 feet in depth; on the bottom level stoping was carried 200 feet west and 30 feet east and the west face of the level showed the vein to be thicker than the east. The structure of the belt indicated that the pay-shoot dipped west. The ore was not so rich on the apex as on the leg of the saddle. Another belt known as the Cantley belt was worked on the north leg sufficiently to show that the workable portions are restricted to certain parts of the subordinate flexure. Further developments may reveal pay-shoots dipping east 10 degrees to 20 degrees with the plunge of the flexure.

As the McNaughton belt[2] has been profitably mined almost to the apex of the fold, 145 feet above the lower[3] level, we may conclude that the denuded portion of the Springfield belt, about 150 feet, was pay-ore which, added to the depth worked, 400 feet, would give a possible total depth of 550 feet of pay-ore on the south dipping veins. The McNaughton belt may, therefore, be expected to carry pay-ore for 400 feet deeper than the 364-foot level. On the south dip the zone of pay-veins is thus approximately 150 feet in width and lies immediately south of the anticlinal axis, along which it extends to great depth, unless a change should be found in the structure of the fold, of which there is so far no indication.

"A continuous zone of pay-veins has been worked to limited depths all along the south limb of the Goldenville anticlinal fold, for an aggregate length of 4,400 feet, from the Springfield to the Palmerston belt, beyond which development has been prevented by the swampy nature of the ground. The surface developments are sufficient to prove that this zone affords a field of virgin ground, large enough for several mines like that operated by the Blue Nose Company."

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 tons		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1862	2,023	0	0	861	3	1	0
1863	3,304	14	12	3,454		19	8
1864	2,611	6	22	1,909	1	7	9
1865	3,137	9	5	2,637	1	3	19
1866	5,157	14	17	2,684	1	18	10
1867	8,522	8	11	5,809	1	9	8
1868	9,778	8	23	11,256		17	9
1869	5,546	11	16	11,500		9	15
1870	7,134	4	0	11,428		12	11
1871	6,579	19	7	14,382		9	2
1872	4,188	9	21	5,323		15	18

---

[1] Faribault, E. R.: Geol. Surv., Canada, vol. XV, pt. A, p. 423, and pt. AA, p. 179.
[2] Geol. Surv., Canada, vol. XV, pt. A, p. 424.
[3] The second level, which was then the lowest level.
[4] This includes the production of Cochrane Hill and Crowsnest.

Production—Continued

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1873	5,026	0	4	7,187		15	9
1874	4,037	1	2	5,430		14	20
1875	5,818	15	10	6,443		18	1
1876	5,176	15	15	6,205		16	16
1877	8,237	3	10	8,654		19	1
1878	6,843	1	15	9,340		14	17
1879	7,389	17	15	9,200		16	1
1880	4,042	7	9	6,465		12	12
1881	2,580	2	20	5,279		9	18
1882	2,542	17	14	6,251		8	3
1883	3,356	18	17	8,470		7	22
1884	2,668	11	0	3,268		16	7
1885	1,238	11	0	2,426		10	2
1886	1,341	3	9	2,850		9	10
1887	585	3	5	2,413		4	20
1888	535	8	18	2,858		3	18
1889	243	17	17	1,618		3	0
1891	119	5	0	464		5	3
1892	179	8	20	893		4	0
1894 (year ending Sept. 30)	552	16	12	708		17	0
1895	1,942	2	0	3,397		11	10
1896	2,796	8	9	5,945		9	9
1897	4,181	18	19	12,659		6	13
1898	5,201	5	10	16,891		6	3
1899	5,118	1	6	18,437		5	13
1900	4,763	12	9	17,711		5	9
1901	3,114	6	21	16,503		3	18
1902	3,720	9	0	15,412		4	20
1903	3,820	12	12	19,221		3	23
1904	1,564	17	12	11,297		2	18
1905	1,053	1	20	4,729		4	1
1906	805	11	0	4,525		3	13
1907	113	0	0	560		4	1
1909	28	6	2	61		9	7
1910	84	11	0	221		7	16
1911 (mortared)	3	9	0				
1914	895	14	0	6,806		2	15
1915	2,125	9	16	19,093		2	15
1916	1,222	16	7	14,711		1	16
1917	275	14	3	4,185		1	7
1918	363	1	22	573		12	16
1919	118	2	2	218		10	20
1920	36	17	0	208		3	13
1921	75	6	16	1,390		1	2
1922	353	16	0	3,760		1	21
1923	236	15	0	1,999		2	8
1924	172	15	0	1,405		2	11
1925	1,178	15	0	7,506		3	3
1926	1,137	10	0	6,797		3	8
1927	1,982	8	12	15,017		2	15
	168,986	8	16	398,912½			

SOUTH BRANCH STEWIACKE

This is situated on South Branch Stewiacke river in southern Colchester, and is reached from Stewiacke station on the Canadian National railway. The Halifax formation is here folded in an anticline the limbs of which dip at a high angle. There are several interbedded, and some small cross, veins and it is said that the latter are the richer. A large cross-vein, three-fourths of a mile to the west of the group of veins on the river, is auriferous.

A discovery of gold[1] was reported from Stewiacke in 1865, and in [2]1867 there was quite an excitement in the district; prospecting was carried on with considerable success and there was talk of erecting a crusher. In 1884, a crusher was rebuilt and a few tons of ore milled, and in 1906 and 1907 some work was done by E. P. Crowe, but mining has not been carried on to any extent. Auriferous drift has been found at different places along the anticline following the ridge running from Gays river to Newton brook and forming the watershed between the upper part of the Musquodoboit and Stewiacke rivers. Several interbedded and cross-veins have been prospected along the anticline. Some of the cross-veins are very large.

Production

Year	Mine	Ore crushed		Gold recovered		
		Tons	Cwt.	Oz.	Dwt.	Gr.
1906	Crowe, E. P.	19	12	....	....	
1907	Crowe, E. P.	181	14	24	18	

SOUTH UNIACKE[3]

Location

South Uniacke gold district is situated on the Dominion Atlantic railway, on the boundary line between Halifax and Hants counties, the mines being situated half a mile east of the station.

Geology

The deposits occur on a subordinate anticline on the north limb of, and about 2 miles north of, the axis of an anticline passing through Lewis, Sandy, and Shubenacadie-Grand lakes. The upper part of the Goldenville formation is here exposed in a small anticline with an undulating axis 2 or 3 miles long. The Halifax formation is exposed half a mile north. On the south side of this small fold the strata dip at a low angle until they reach the syncline a short distance to the south, whereas on the north side the dip increases until it becomes vertical at a distance of 900 feet. The axial plane, therefore, dips to the south at an angle of about 45 degrees.

Character of the Deposits

All the veins[4] worked in this district lie in the stratification planes on the north limb of the anticline. The only veins that have been worked to any extent are the Hard and Slate leads. A rich and wonderfully regular streak, dipping east at an angle of about 28 degrees, has been worked on three different properties on the Hard lead for a total length of 1,200 feet on the incline. Parallel with this and above it about 40 feet in the same vein was another pay-shoot smaller and less important. The thickness of the paying part of the vein was 4 to 5 inches and the rest was only 1 to 2 inches. The Slate lead lying south of the Hard has been worked throughout a length of 1,800 feet to depths of 100 to 400 feet and at the 300-foot level there is 800 feet of stoping. The auriferous part of this vein extends farther west than that of the Hard lead, but not so far east.

History

The details given in the reports of the Department of Mines, Nova Scotia, are not complete enough to furnish a connected history of the operations of the district, but a study of the gold returns shows that almost continuous work was carried on in this district from the time of the discovery until 1900, and resumed for two or three years since then.

---

[1] Rept. Chief Commissioner of Mines, Nova Scotia, 1865, p. 9.
[2] Rept. Chief Commissioner of Mines, Nova Scotia, 1867, p. 9.
[3] Plan published.
[4] Faribault, E. R.: Geol. Surv., Canada, vol. XII, pt. A, p. 180.

A discovery was reported in 1887, and the next year energetic mining was carried on by J. J. Withrow and continued to be carried on with most satisfactory results for several years. In 1889, the property to the east of Withrow's was opened by Mr. Thompson and rich ore was reported. This mine, known as the Thompson and Quirk mine, continued a steady producer for several years, the ore being crushed at their 5-stamp mill, designated the Eastville crusher. The following is a statement of the official returns from this mine:

Year	Ore crushed	Gold recovered		
	Tons	Oz.	Dwt.	Gr.
[1] October 1889 to December 31, 1891	298	3,201	15	
1892	180	1,803	4	18
1893	115	1,175	6	11
1894	129	790	3	2
1895 (5 months)	66	104	10	6

The same company did some work on the Slate lead to the south, and in 1893 they had a shaft 325 feet deep on this lead. The Slate lead was also mined by the J. J. Withrow Mining Company—Mr. Leedham, manager—and in 1897 this company had four shafts from 100 feet to 225 feet deep, and had stoped a length of 900 feet. Active mining, presumably on this lode, was continued by this company evidently until some time in 1899.

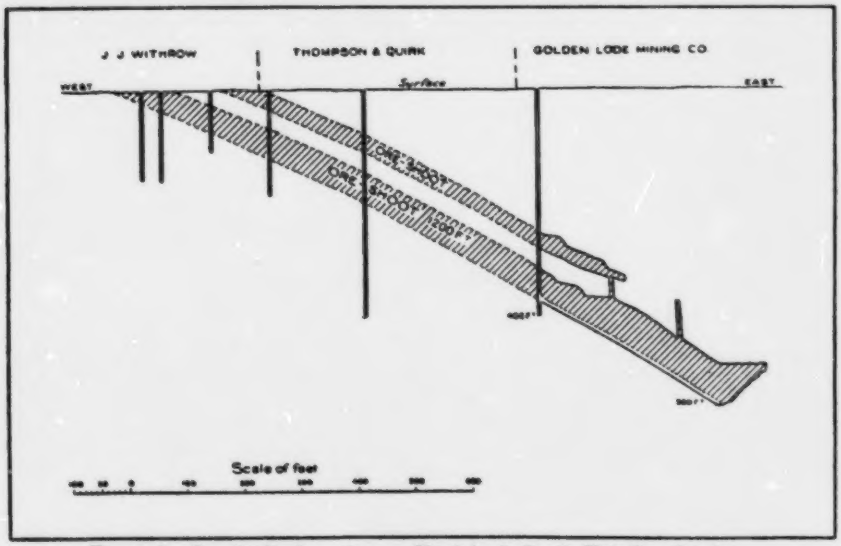

Figure 8. Longitudinal section on Hard lead, South Uniacke, showing workings of Golden Lode mine and approximate position of ore-shoots.

In 1894, the Golden Lode Mining Company, Limited, acquired areas on the Hard lead east of Thompson and Quirk's property, and under the management of A. A. Hayward a vertical shaft 403 feet deep was sunk, which cut the rich pay-shoot at a depth of 375 feet. A 5-stamp mill was erected and the pay-shoot was followed on its dip to the east. Very rich ore was taken from this mine during 1894 to 1896 inclusive, but in 1897 there was a change in the character of the ore to the east, the quantity of the ore raised this year was much reduced, the yield per ton was less, and at the time of the inspector's visit the mine was idle. W. A. Sanders, however, did a little work here subsequently.

---

[1] Can. Min. Man., 1896, p. 170.

Work was started again on the Slate lead on the old Withrow property by the Victoria Mining Company in June, 1902, but little was accomplished until 1903. The 300-foot shaft was deepened to 400 feet, levels were driven, and some stoping done. In 1903, the manager, John Kenty, had thirty-two men at work and the next year P. R. Curtis was manager and had about the same number of men employed. The company closed down about the beginning of the fiscal year of 1905, and little has been done in the district since.

In 1922 a new shaft was started on the Golden lode by Reginald Withrow, and a promising lead was struck by Withrow and Son in a trench on the west side of the railway half a mile from the station.

General Development

The published plan for which the survey was made in 1899 shows the location and depth of the shafts. Future explorations may be governed by the fact that the rich ore already found in this district lies in a narrow zone intersecting the strata at a very slight angle at that part where they approach the vertical dip. It seems advisable that in prospecting leads north of the Hard lead operations should be directed to those parts lying to the east, and on those leads lying south of the Hard lead operations should be directed to those parts lying to the west.

The production is included with that of Mount Uniacke.

TANGIER[1]

Location

Tangier gold district is situated in Halifax county, at the head of Tangier harbour and Pope harbour on the Atlantic coast. It lies 63 miles by post road east of the city of Halifax from which it is also accessible by water.

Geology

The Goldenville formation[2] is here brought up in the Tangier-Harrigan Cove anticline, the most southerly anticline exposed on the mainland in the eastern part of the field. The fold runs east and west (magnetic) and plunges in both directions at angles less than 15 degrees, forming a very long, narrow dome. The strata dip to the north and south at angles increasing to 70 degrees, thus forming a symmetrical fold with a vertical axis-plane. The rocks have been disturbed by two important series of faults, which have been located by the mining operations and surface explorations conducted in this district. These faults have a general strike northwest and southeast and dip at high angles. The eastern series occurs on Strawberry hill in the eastern part of the district and consists of right-hand faults with horizontal displacements varying from a few feet up to 76 feet and aggregating some 280 feet. The western series lies in the vicinity of and west of the Essex mill and consists of left-hand faults with horizontal displacements varying from a few feet up to 150 feet and aggregating 470 feet. The block of strata between these two series of faults has thus been shoved some distance to the north. In one place fault breccia has been noticed attaining a width of 30 feet. The vertical displacement of these faults is not known and they present serious difficulties in mining.

A geological feature not known in any other gold district east of Halifax is the dioritic dyke, striking north and south and cutting the strata at right angles. It has a uniform width of 40 feet and has been traced in a straight line for 2 miles to Grum point on the seashore. It does not affect the richness or size of the veins it cuts, and does not appear to be auriferous. There is no faulting along its plane and the only apparent result of the intrusion is the alteration of the intruded rock for a short distance on each side.

---

[1] Plan published.

[2] Faribault, E. R.: Geol. Surv., Canada, vol. XI, pt. A, p. 187.

Character of the Deposits

The veins are of the interbedded class and nearly all the work has been limited to those found on the south limb of the fold. Only a few veins have been opened on the north limb, and none to any extent.

Auriferous veins have been extensively developed for a length of over 2 miles along a narrow and well-defined pay-zone. This zone touches the anticlinal axis at the centre of the dome, two areas east of the original free claim area, where it has a width of some 200 feet, and from this point it runs east and west bearing a few degrees to the south of the course of the anticlinal axis and not increasing very much in width. Within this zone the different leads have suffered enlargements and enrichments, which have been worked to the west on the Big South, Little South, Nugget or Kent, Nigger, Leary, Lake or Rose, Tennant, and Field leads; and towards the east on the Little South, Nugget or Kent, Twin or Dunbrack, Forrest, and Wallace leads. The following notes on some of the most important lodes have been taken from reports by Silliman, Hind, and Townsend.

Lode	Thickness in inches	Remarks
Big South	4 to 6	
Little South	2 to 3	Yield in early days averaged 3 ounces per ton
Kent or Nugget	12 to 24	Highly pyritous, quartz oily
Negro	10 to 24	Crystalline quartz carrying calcite, siderite, pyrite, mispickel. Gold in showy specimens associated with calcite. Hanging-wall is quartzite filled with mispickel and pyrite
Leary	6 to 10	Oily quartz with slate films, and mottled with blue or grey patches. Gold in crystalline particles in scales, and in threads and veinlets binding the quartz together. Associated with the gold are pyrite, mispickel, sphalerite, and galena. Hanging-wall is quartzite charged with pyrite and mispickel, and the foot-wall is soft, dark blue slate with pyrite and mispickel in bunches frequently surrounded by dolomite and siderite
Lake	6 to 10	Quartz oily and laminated
Forrest	3 to 6	3 to 6 inches of slate crushed with the quartz. One of the most important veins of the district
Dunbrack	....	A belt of leads, whin-bound, and furnishing about 1 foot of crushing material
Wallace	....	Gives 6 to 24 inches of crushing material

A few veins have been tested on the western plunge of the anticline at the mouth of Tangier river, the most important being the Fox lead. There has also been a little prospecting west of the harbour. Much prospecting has also been carried on for the source of rich drift found 450 feet south of the Essex mill.

History

In October, 1860, Peter Mason discovered some auriferous quartz in the bed of a brook a short distance north of Rush lake. As soon as the fact became known a number of people flocked to the locality to search for the source of gold, but as the ground was frozen, and as Mr. Mason was unwilling for them to prospect on his land, little was done until the following year.

In April, 1861, the district was proclaimed and William Anderson proceeded to lay off mining lots measuring 50 feet across and 20 feet along the supposed course of the leads. Nearly one hundred of these lots were soon leased, at an annual rental of $20, and in a short time about 600 men were engaged in mining or prospecting. Among the pioneers of this district may be mentioned Captain Archibald and Messrs. Murphy, Leary, and Barton. Many of these, however, soon became discouraged and went to seek their fortune in other districts, in many of which gold was discovered this year. O. C. Marsh, writing to the *American Journal of Science and Arts*, vol. XXXII, November, 1861, states that two crushers were then nearly completed. One of them

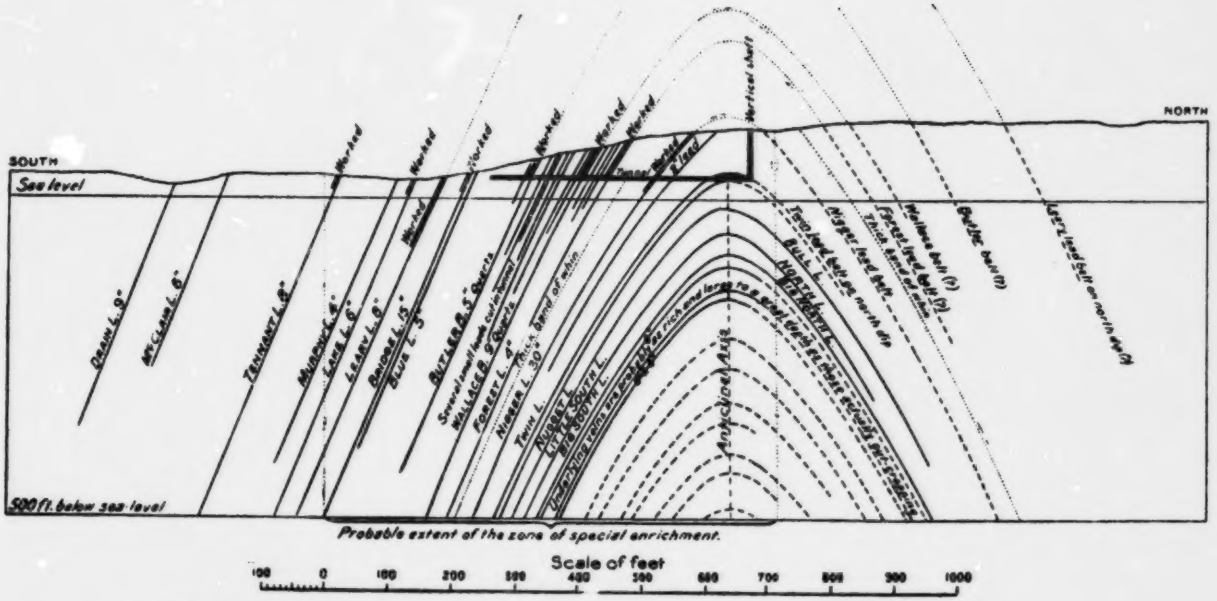
SOUTH
Sea level
500 ft. below sea level
NORTH
DRAIN L. 9"
McCLAIM L. 6"
TENNANT L. 8"
MURPHY L. 4"
LAKE L. 6"
LEARY L. 6"
BRIDGE L. 15"
BLUE L. 3"
BUTLER B. 5" Quartz
Several small leads cut in tunnel
WALLACE B. 9" Quartz
FOREST L. 4"
NIGGER L. 30"
Thick band of whin
TWIN L.
NUGGET L.
LITTLE SOUTH L.
BIG SOUTH L.
Underlying veins are probably as rich and large to a great depth as those actually out-cropping
Anticlinal Axis
Worked
Tunnel
Worked
Z lead
Vertical shaft
NORTH L.
LITTLE NORTH L.
BULL L.
Twin lead belt on north dip
Nigger lead belt
Thick band of whin
Forest lead belt (?)
Wallace belt (?)
Butler belt (?)
Leary lead belt on north dip (?)
Probable extent of the zone of special enrichment.
Scale of feet
100
0
100
200
300
400
500
600
700
800
900
1000

Figure 9. Section across anticlinal fold between Copper and Rush lakes, Tangier gold district.

was very similar to the arrastre and "consisted, essentially, of two large granite boulders, attached by short ropes to a horizontal beam, on either side of an upright shaft, around which they were drawn by a pair of horses. The quartz was put on a paved floor and kept wet, and was crushed by the boulders as they were dragged over it.

By 1862, twelve auriferous veins had been opened, the richest of which were supposed to be the South, Leary, and Nigger. The South lead was traced 1,500 feet and a number of shafts were sunk varying from 60 to 95 feet in depth. Several shafts although yielding well had to be abandoned on account of difficulties with water. The yield per ton was from ½ ounce to 6 ounces. The Nigger lead was traced 2,500 feet and a 60-foot shaft was the deepest sunk, much of the quartz not being rich enough to pay expenses. The Leary lead was worked upwards of 1,000 feet and the average yield was estimated at 1 ounce, 11 pennyweights. The Wallace vein was also worked.

Much difficulty was experienced in these early days at Tangier through the small size of the areas. The shafts were too numerous for economical work, no plans could be made for continuous and extensive mining, the size of the areas would not justify the erection of any but the cheapest and crudest machinery, there could be no system of control of the water, and in many cases the water from one mine flooded another, and the greatest care had to be exercised to keep from encroaching on the property of one's neighbour. The result was that many areas were abandoned, and mining was of a very superficial nature.

In 1863, great numbers of these areas passed into the hands of companies who aimed at buying up a lot of adjoining areas, sufficiently numerous to justify the company in erecting proper machinery and initiating an economical mining system. Some difficulty arose through the absence of many lessees or the defective nature of the titles. However, during this year there was very little mining done by the small proprietors, and practically all the mining and milling were in the hands of three or four companies.

One of these was evidently the New York and Nova Scotia Gold Mining Company, on whose property B. Silliman reported in February, 1862. The plan accompanying the report shows their property lying between Rush and Copper lakes, extending north from Rush lake and including the Lake, Leary, and portions of Negro, Kent, South, and North lodes. Development had been pushed chiefly on the Leary and Negro lodes and a tunnel driven north to cut the Negro lode. There was a 24-stamp mill, two Chilian mills or edge stones and round buddles to concentrate and save the auriferous sulphides. There were also two kilns constructed of quartzite and calculated to hold 25 or 30 tons each. To fill, fire, and discharge a kiln required three days. The concentration of the ore was rendered more difficult by calcination, and although the heated ore, when quenched with water, was more friable and could be milled more rapidly, it was the opinion of many experienced men that calcination was not economical.

We learn from Silliman's report that a company had drained Copper lake with the hope of finding fabulously rich placers, but had been disappointed. On sinking pits to the underclay and washing the dirt, gold could be found in small, unrounded nuggets, but not abundant enough to satisfy the company and the enterprise was abandoned.

To the west of Copper lake was the property of the Atlantic Mining Company. At the close of 1863 there were three steam, and three water, mills in the district.

During 1864 the production was not so great as had been anticipated from the preparations made in 1863, but the following year there was some improvement. During 1865 alluvial washing was commenced, but was hindered by the dryness of the season. In 1866 vigorous operations were carried on and the yield of gold per man engaged was greater than any previous year. During this year some large and rich specimens were taken from this district. The Nigger and Leary lodes were worked by Messrs. Barton and Company, but work on these lodes was discontinued in 1867. In 1867, Mr. Forrest did some work on Strawberry hill and continued operations there for a number of years. The next year four shafts were worked on the Forrest lode, and three on the Dunbrack lode, and a 200-foot tunnel was driven to cut the Wallace lode. In 1869 operations were continued on the Forrest and Wallace lodes and another lode, about 70 feet north of the former. During this year the property of the New York and Nova Scotia Gold Mining Company was purchased by H. R.

Fletcher, and the Burlington Gold Mining Company proceeded to work the Leary, Nigger, and other leads. Prospecting was continued also by Messrs. Barton and Estey and a 200-foot tunnel was driven, which cut several lodes.

During 1870 and 1871 mining in this district was brisk. The Burlington Company stoped the Leary and Nigger leads and connected the Leary and Lake leads by a tunnel. The crusher of 8 stamps was enlarged to 16 stamps. The mine was closed during the June quarter of 1871, but work was afterwards resumed. The production of this mine for 1870 was 548 ounces from 1,104 tons, and in 1871, 180 ounces from 388 tons. The Strawberry Hill Company was particularly active. A 10-stamp mill was in operation and the Wallace, Forrest, Hill, Tunnel, and Dunbrack lodes were worked, the Dunbrack and Forrest receiving the most attention, and the latter being by far the most productive. Several shafts were sunk, levels driven, and underhand stoping carried on. The production of this company for 1870 was 838 ounces from 789 tons, and in 1871, 1,154 ounces from 1,212 tons. A report made on this property by H. Y. Hind, in October, 1871, was accompanied by a plan and a diagram showing the stoping on the Forrest lode. In 1870, Andrew McG. Barton did some prospecting and mining on the property adjoining the Strawberry Hill property. He had an 8-stamp mill, run by waterpower. These two years were the most productive in the history of the district.

After this came a long period during which much of the work of the district was in the hands of tributers.

In 1872, tributers did a little work on the property of the Burlington Gold Mining Company on the Leary and Lake leads, and some prospecting on the Big South lead.

On Froud's property some work was done on the Hill and Dunbrack leads and the Strawberry Hill Company was active during a part of the year. Mr. Forrest, as a tributer, worked the Little South lead on the areas of the Tangier Mining Company, stoping it out 300 feet in length to a depth of 25 feet.

In 1873, the Strawberry Hill Company was at work. Mr. Forrest was the principal operator, and his tribute right on the Tangier Mining Company's property having expired, he abandoned his work on the South, the Little South, and North leads and prospected on Strawberry hill. He discovered a lead, but abandoned it the following year to work on the Dunbrack, which lies about 200 feet to the south. Tributers on Froud's property succeeded in discovering a promising 7-inch lead on areas 233 and 235, and some excitement was produced by the striking of rich quartz on the Field lead near the river. The next year the chief operations were on Strawberry hill, the Dunbrack lead being worked by both Mr. Forrest and Mr. Townsend. Some work was done by Messrs. Ross and Miller on the west side of the river on a supposed extension of the Leary lead.

Mr. Forrest carried on operations on the Murphy lead in 1875 and 1876, and erected an 8-stamp mill north of the lead, and Mr. Townsend worked the Dunbrack lead in 1875 and the Forrest lead in 1875 and 1876. In 1877, Mr. Barton opened one of the leads he exposed by his surface drifts immediately to the north of the alluvial workings of 1867, and late in the year some tributers prospected on the Burlington property. In the following year work on the lead opened by Barton was discontinued and a lead on the same strike farther west was opened by three shafts. Near this also a supposed extension of the Nigger lode was opened. The Nigger was worked from the old tunnel and the well-known Leary lead reopened by two sets of tributers.

In 1879, the Leary lode was worked during a part of the year, and Messrs. Barton and Murphy worked the eastern extension of the South and Nigger lodes. The Messrs. Ferguson worked the Field lode on tribute; the area containing this lode was purchased by Messrs. Torrance and Scaife, who purposed organising a company and erecting a mill on the river. This property was worked the next two years by the Pittsburg Gold Mining Company, who crushed their ore at a 10-stamp mill run by waterpower, which they had erected on the west side of the river. In 1882 they discontinued operations.

For several years Mr. Townsend continued work on Strawberry hill. In 1879, the Forrest, Dunbrack, and Wallace lodes were worked; in 1880, the Forrest and Dunbrack lodes; in 1881 the Forrest lode on Butlers hill and the McDonald lead near the dyke were prospected, and in 1882 the mill was refitted and work was done on the Forrest and other lodes near the Mooseland road.

In 1880, Mr. Barton worked on the Blue lead during the early part of the year, but later transferred his operations to the Nugget lode. In 1881, the Satemo Gold

Quartz Company purchased the Barton Washings, made extensive openings on the Nugget and Kent lodes, and erected a 10-stamp mill. They continued their operations on these lodes in 1882, during which year the Kent Gold Quartz Company worked the Kent and Nigger lodes, crushing their ore at the Pittsburg mill.

In 1883, mining was confined principally to Strawberry hill where the Brunswick Gold Mining Company overhauled the mill, erected new buildings, and carried on operations on the Forrest lead in the vicinity of the Mooseland road. The next year work continued, and in 1885 a little was done by the Essex Gold Mining Company and on Strawberry hill by Mr. Townsend. For several years the production continued to decline until in 1889 it was so small as to be included in the Report of the Department of Mines under the heading 'Other Districts'.

The work on Strawberry hill was least interrupted, and a little work was reported from this mine nearly every year until 1891.

In 1886, Mr. Miller worked on the Leary lead and Mr. Murphy on the west end of Nugget lode. In 1887, the Essex Gold Mining Company reopened and worked their mine for a time. In 1889, John Murphy and others did a little work, and in 1892, Mr. Murphy, who never lost faith in the district, was still at work. In 1895, he had five men at work on the Essex property and in 1896 he was still on the property working the Nigger lead. In this year, Messrs. Fox, Watts, and Clements worked the same lead, but farther west on the Kent property.

In 1898, there was a marked revival of activity in the district. Miner Foster secured by purchase or option the western half of the district and sold to the Tangier Gold Mining Company. Active operations on the Leary, Nugget, and Murphy Twin leads led to a great increase in the production of this district. The 10-stamp mill in the eastern part of the property which had been driven by waterpower was remodelled and ten additional stamps put in. This company continued work in 1899 under the management of A. E. McPhail and sinking, drifting, and stoping were done on the Little South, Twin, Nigger, and Fox leads.

During 1900 and 1901 the mines were worked by the Worcester-Tangier Gold Mining Company and sinking, driving, stoping, and a small amount of crosscutting were done.

The mines shut down in September, 1901, but were reopened in June, 1902, by the Tangier Amalgamated Mining Company, Limited—Arch. McPhail, manager. Little underground work was done in 1902; a little stoping was done on the Nugget lead, the Kent shaft was opened and retimbered, and the driving of levels was started. In 1903 work was confined principally to the Kent shaft, but little was done.

In 1905, a little work was done here on the Leary, Nugget, and Nigger leads by the Boston-Tangier Mining Company. Work started on the Nugget lead in October, 1904, but all operations ceased the following summer.

In June, 1906, the shaft on the Leary lead was reopened and sinking commenced by Joseph Mason for the Dominion Mining Company. Some levels were driven and a small amount of stoping done. The following year work was continued by the same company under the management of A. E. McPhail, a greater number of men were employed, and 201 ounces of gold was extracted from 647 tons of quartz. Work was carried on on the Kent lead in 1908, the shaft was carried to a depth of 350 feet, and at the 340-foot level a crosscut was driven south cutting the Murphy-Twin and Nigger leads, on both of which levels were driven. A crosscut was also started to the north. In the latter part of 1908, the Dominion Mining Company contracted for an electric plant to be driven by waterpower, and in 1909 this plant was completed.

The Dominion Mining Company continued operations on the Kent lead for several years and was succeeded in 1916 by the Bradford Mines, Limited. In 1910 the shaft was carried to a depth of 525 feet and ore between the 340-foot level and the 220-foot level was stoped. In 1911 ore between the 475-foot level and the 340-foot level was stoped. In 1912 the shaft was sunk to a depth of 610 feet, levels were driven at a depth of 600 feet, and ore was stoped on the same level as in 1911. In 1914 the following levels had been driven; the 220-foot level 310 feet east, the 340-foot level 382 feet east and 55 feet west, the 475-foot level 500 feet east and 302 feet west, and the 600-foot level 248 feet east and 55 feet west. A crosscut on the 340-foot level had been driven north 128 feet and south 83 feet to the Nigger lead, and one on the 475-foot level had been driven south 87 feet. In 1915 the drift on the 475-foot level was advanced 80 feet and ore was stoped on the 475-foot and 600-foot levels, and in 1916 ore was stoped on the 475-foot level. In 1917 the 475-foot level was advanced and stoping continued, and a small amount of work was done on the Nigger and Bradford Twin leads. In 1910 the production amounted to 866 ounces from 3,090 tons of ore; in 1911, 1,741 ounces from 5,190 tons; in 1912, 1,161 ounces from 3,850 tons; in 1913, 678 ounces from 2,900 tons; in 1914, 57 ounces from 419 tons; in 1915, 472 ounces from 1,967 tons; in 1916, 123 ounces from 601 tons; and in 1917, 583 ounces from 743 tons. In 1921 the Bradford Mines, Limited, resumed operations and in 1926 this company under the management of A. L. Schneider drove a crosscut on the 340-foot level on the Kent lead north about 375 feet to intersect the Big North lead. Several promising leads were cut.

General Development

The published plan for which the survey was made in 1898 gives a good idea of the extent to which operations have been carried on. Although a great many shafts have been sunk on the different leads the most of them are 100 feet or less in depth, several are between 100 and 150 feet, only three or four are over 200 feet, one on the Leary lead being 250 feet in 1907, and one on the Kent lead being 610 feet. It seems probable that in many of the veins the bottom of the paying ore has not been reached. However, it may be that the pay-shoots do not extend to a very great depth in any of the veins. The pay-zone does not appear to have a great width, being only 200 feet wide at its centre and not much wider at the east and west, and, as its dip is probably parallel with the axis plane of the fold, and, therefore, vertical, and the veins dip between 55 degrees and 65 degrees to the south, the southern limit of the pay-ore may be reached at no great depth, especially on the southerly veins. Cross-cutting to the north will have to be done in order to keep in the pay-zone and open the rich portions of lower veins.

The western ends of the Little South and Big South leads seem to be favourable ground for deeper work since they were sufficiently rich to be worked to depths of 100 to 140 feet on lots only 50 feet by 20 feet in the early days. It seems probable that the early miners, under such conditions, were not able to reach the bottom of the good ore.

Production[1]

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1862	865	0	0	707	1	4	11
1863	494	8	21	655		15	2
1864	363	2	0	468		15	12
1865	741	7	15	681	1	1	19
1866	420	0	3	956		8	19
1867	395	16	10	486		16	7
1868	1,240	17	6	986	1	5	4
1869	1,192	3	10	1,332		17	21
1870	1,814	2	10	2,732		13	6
1871	2,093	0	7	2,924		14	7
1872	829	8	13	1,622		10	5
1873	726	11	16	1,070		13	4
1874	419	7	5	706		11	21
1875	448	2	15	1,106		8	1
1876	382	13	0	716		10	17
1877	410	14	15	364	1	2	13
1878	584	10	22	1,035		11	7
1879	857	7	12	1,454		11	19
1880	530	14	3	790		13	10
1881	399	9	16	716		11	3
1882	789	11	16	1,622		9	17
1883	798	11	18	1,140		14	0
1884	924	2	19	1,330		14	0
1885	431	9	14	874		9	9
1886	360	19	14	936		17	17
1887	311	10	13	738		8	10

---

[1] Includes the production of Mooseland.

Production—Continued

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1888	263	1	0	539		9	18
1889	112	4	12	427		5	5
1891	13	3	12	42		6	6
1892	103	8	0	311		6	15
1893	399	12	13	1,183		6	18
1894	464	7	0	1,469		7	6
1896	85	11	0	593		2	21
1897	299	14	0	372		16	2
1898	1,341	0	0	1,134	1	3	15
1899	1,000	15	0	2,553		7	20
1901	436	10	0	936		9	8
1908	256	0	0	567		9	1
1909	63	0	0	180		7	0
1910	875	2	0	3,115		5	15
1911	1,746	13	0	5,202		6	17
1912	1,161	9	0	3,850		6	1
1913	677	15	14	2,900		4	16
1914	56	17	3	416		2	18
1915	472	9	19	1,969		4	19
1916	123	6	22	701		4	3
1917	582	19	21	743		15	16
1919 (mortared)	4	5	0				
	29,364	9	1	57,350			

UPPER SEAL HARBOUR[1]

Location

Upper Seal Harbour gold district is situated in Guysborough county at the head of Isaac harbour, and about 2½ miles north of Isaac Harbour gold district. It is reached by coach from Antigonish on the Canadian National railway, and by packet from Halifax.

Geology

The Goldenville formation is here exposed in a closely-folded anticline having a general course of north 60 degrees west (magnetic). This anticline plunges to the east at an angle increasing from 10 degrees at the west end of the district to 32 degrees at the east end, whereas the strata on both limbs have about the same inclination to the north and south, the angle of dip increasing from 50 degrees near the apex to 80 degrees some distance from it. Work on Dolliver mountain shows that the axial plane dips south 4½ degrees. The fold is sharper at the Dolliver Mountain mine than at the Richardson mine and it flattens still more farther east. Even on the Richardson vein a broadening with depth is quite perceptible.

The fold is affected by three main faults, and as the greater part of the district is covered with drift the location of these faults becomes a matter of some importance in tracing the anticlinal fold along which the ore deposits so far worked are found to lie.

The eastern fault has been indicated on the plan as lying west of Dolliver Mountain gold mine along the north branch of Davidson brook, but more developments made by G. J. Partington on the Dolliver Mountain property have shown that it more probably follows the course of Davidson brook in a southwest direction to the harbour where it joins the main harbour fault. This has a horizontal displacement of 400 feet to the north on the east side.

The Middle fault, known in Isaac Harbour gold district as the main harbour fault, lies here 600 feet west of the mouth of Isaac Harbour river and follows the general course of Northwest Branch brook to the head of the harbour, down which it runs, passing between Hurricane island and the eastern shore. By this fault the anticline is shoved 1,100 feet to the north on the east side.

---

[1] Plan published.

The western fault runs parallel to the latter along the valley of the south branch of Smelt brook of Country harbour, and is well seen at the Porcupine rock.[1]

Character of the Deposits

The veins all follow the planes of stratification and some of them attain a great thickness on the apex, in some cases over 20 feet, thinning down on the legs. The Howard, Forge, and Partington veins were found to measure respectively 10, 30, and 33 feet vertically on the apex and to become much thinner on the legs; the Richardson belt showed a thickness of 20 feet on the apex, 7 feet on the north leg, and 8 feet on the south leg. Underground developments like those at the Dolliver Mountain mine where a vertical shaft was sunk on the apex of the anticline have proved a succession of saddle veins. Operations have been restricted to the apex or its vicinity and it seems that the conditions for ore deposition lay within a short distance of the anticlinal axis.

The Richardson belt[2] is the one on which the great proportion of the mining in this district was done. It consists of a belt of quartz and slate lying between well-defined walls of quartzite. The foot-wall is a thick belt of quartzite. It is cut by a network of angulars, very numerous at the apex but decreasing in number with distance from it. The angulars running into the hanging-wall are also more numerous on the apex than elsewhere. The quartz of the vein is very irregular in quantity and distribution throughout the thickness of the belt; in some places almost the whole belt for a width of 6 or 8 feet is quartz, whereas in other places the quartz may entirely disappear. As a rule the proportion of quartz is greater near the apex and on the apex little or no slate is to be seen. At the apex, the quartz is white and coarse-grained and carries a little arsenopyrite in masses, but where it thins down on the legs it is of a ribbony structure. The faults affecting this vein are all small, run in various directions, and generally die out in less than 100 feet.

Although the greater part of this belt has been milled and has furnished a large body of low-grade ore, careful sampling and assaying on the 400-foot level showed that the gold is not evenly distributed, but is concentrated in zones, one on each limb of the anticline, and investigations point to the probability that these pay-shoots dip to the east, at about the same angle as the plunge of the anticline, but recede from the anticlinal axis with depth. In the 400-foot level, driven on each leg of the saddle, the face was sampled and assayed after every cut, and at the same time one battery was cut out and run continuously on test crushing.

The quartz[3] on the apex was a dense, glassy quartz of low value and containing little slate or sulphides. This continued for a considerable distance on the south side and the walls were smooth and regular. At a certain point a marked change became evident both in the character of the walls and of the vein. The hanging-wall became shattered and the lead became impregnated with mispickel embedded in a velvety black slate, and assays and mill tests showed an increase in the gold content. This condition continued for 200 feet along the level, when the walls again became smooth and regular and the quartz formed in narrow veins interlaced with slate of a different character, containing a very small amount of sulphides. The level was continued 600 feet farther west, but no further discoveries were made. In a level 150 feet above this, similar conditions were found to exist and stoping was carried along the lower limbs of the pay-shoot.

The same conditions were found on the north leg, and at a point 600 feet from the apex the vein commenced to widen and increase in value, and the slate became black and impregnated with sulphides. This continued along the level 300 feet and its maximum thickness was 22 feet. Stoping revealed clearly the line of the roll and the bottom of the shoot was outlined.

The underground explorations of the Dolliver Mountain Mining Company exposed several large saddle veins, but few, if any, of these were sufficiently auriferous to be profitable.

---

[1] Faribault, E. R.: Geol. Surv., Canada, vol. X, pt. A, p. 105.

[2] Brown, E. Percy: Min. Soc., N.S., vol. XIII, p. 18.

[3] Badger, H. S.: Jour. Min. Soc., N.S., vol. XIII, p. 89.

Three of the East Goldbrook belts have been tested to a depth of about 150 feet. They form a somewhat broader saddle than the Richardson and lack the heavy quartzite walls of the latter. One of these has a marked enlargement at the shoulder on the south side and in this some remarkably rich ore was found. Further development may prove a zone of enrichment affecting the shoulders of the other belts. Two thousand feet east of these belts two veins have been opened.

There has also been some development work on each side of the line between the Richardson and McMillan properties. Prospecting has been carried on all along the anticline as far as Country Harbour, but nothing of any account discovered.

History and Development

More or less prospecting had been done in this locality for a number of years, but it was not until 1892, on the occasion of the tracing of the anticline through this section by the Geological Survey, that Howard Richardson made the discovery of the large body of low-grade ore afterwards known as the Richardson belt.

The history of this district is in the main the history of the Richardson mine, which has been worked almost continuously from the time of its discovery until very recently and has turned out a great quantity of low-grade ore, approximately 375,000 tons, from which a little over 50,000 ounces of gold was recovered.

In the year of its discovery, 1892, preparations were made by the Richardson Gold Mining Company for carrying on operations, and thirty-one men were employed by C. F. Andrews in erecting buildings and putting up a 15-stamp mill. This mill, which was soon increased to twenty stamps, was running early in 1893. In July the shaft was down 90 feet, and the next year prospects were such as to justify remodelling and improving the machinery so as to increase its efficiency. Work was continued in 1895 and the shaft on the south dip was continued to a depth of 156 feet. In 1896 work was vigorously carried on under the management of C. R. Andrews, and ore was carried by a trestle 1,200 feet long from the shaft to the mill situated on the side of the lake. Twenty new stamps were added to the mill, thus making it a 40-stamp mill. In August, 1897, sixty-five men were employed and operations were carried on under the management of A. B. Fox. The shaft on the south side was then down 195 feet and on the north side 125 feet, and a raise was started at the east on the apex of the anticline, which when completed would make the third shaft, all of them worked from the one shaft house.

Seventy-five men were employed in 1898, and 2,479 ounces of gold was recovered from 24,121 tons of ore. The east inclined shaft, which had been opened, was down 260 feet and the south one 240 feet. Owing to the poor timbering in the mine several falls of rock occurred this year, one at the south side of the main shaft being a very serious one. A Wilfley concentrator treated the tailings from the mill. In 1899, 150 tons of concentrate worth $45 per ton had been saved from the tailings from twenty stamps and this year the other stamps were raised so that the tailings could be similarly treated. The eastern or main inclined shaft had reached a depth of 400 feet and another shaft was started on the north dip 200 feet west of the north shaft. All the old workings were retimbered, in a very substantial manner, and large pillars were left to support the roof. In 1900, ninety-six men were employed, and the eastern or main shaft was 530 feet deep at an angle of about 21 degrees and the north shaft 280 feet. This year two Wilfley concentrators were run and two more were to be added, and a Rand air compressor, capable of running eight drills, was set up. In 1901, the main shaft had reached a depth of 620 feet and stoping was vigorously carried on on both legs of the vein by the underhand method, great precautions being taken to provide against the possibility of any further crushes of the hanging-wall, similar to that which took place on the south leg in 1900. The thickness of the orebody around the bottom level varied from 4½ feet to 15 feet and of this 60 per cent to 70 per cent was quartz. Twenty additional stamps were erected bringing the number up to sixty, and the concentrates were recovered by means of four Wilfley tables.

In 1902, the main shaft was deepened to 760 feet, and 29,000 tons of ore was taken out from which 3,459 ounces of gold was recovered. A vertical shaft that had been sunk to the east of the workings to test other veins overlying the Richardson had been allowed to fill with water. At a depth of 150 to 200 feet in this shaft a vein had been cut on the south dip and a crosscut driven to the north. During a part of the year the tailings were treated without concentration in an extensive cyanide plant that had been brought from Caribou district the preceding autumn. This plant was owned by J. R. Stuyvesant and managed by H. S. Badger. The results of the treatment appear not to have been satisfactory, for before the end of the year the cyanide plant was closed and tests were made with the bromo-cyanide process of treating concentrates.

In May, 1903, this property passed into the hands of the Boston-Richardson Mining Company. In March, this year, mining was suspended owing to an extensive crush which destroyed the main shaft. The vein here pitches at a low angle to the east and insufficient support had been left to sustain the great weight of the hanging-wall. Fortunately the men were at the time in the lower levels, partly protected by the pillars in those workings, and made their exit by way of the north shaft. To efficiently continue work on the main belt the new company started to enlarge and deepen the vertical shaft that had been sunk 850 feet to the east of the old shaft house. It was enlarged to 19 feet by 6 feet and was made a three-compartment shaft. This shaft was continued in 1904 under the management of H. Playter, and at the time of the inspector's visit it was about 410 feet deep. Eight veins were cut in the sinking and at a depth of 386 feet a seam of gouge was cut and below this a considerable quantity of quartz mixed with the rock. This proved to be the Richardson belt. A station was made at 400 feet and levels were driven on both the north and south legs of the saddle. From April to June, 1905, the underground works were practically idle while the plant was being overhauled and repairs made. Experiments were conducted by Messrs. Badger and Brown in the bromo-cyanide process, and six Wilfley concentrators were put in.

About June, 1905, H. S. Badger was made manager, and with the help of E. Percy Brown, instituted a thorough system of sampling and mill testing which showed that all portions of the vein were not equally auriferous, but that the great proportion of the gold was found in shoots. The north level was driven 360 feet and the south one 320 feet and ore was removed by the overhand method. Thirty stamps were kept running and the concentrates were treated by the bromo-cyanide process. An ingenious method was devised for keeping a record of the extent of the development and stoping. In addition to the ordinary mine plans and sections, there was constructed a model of the mine as it would appear were all the rock above the belt removed. The model was constructed to scale and as underground operation progressed portions of plaster of Paris representing the belt were cut away to show the levels driven, and the areas stoped.

In 1906, the following officials were in charge: Franklyn Playter, general manager, H. S. Badger, superintendent; John Warner, foreman; E. Percy Brown, chemist and assayer. There were 126 men employed, and the 400-foot level on the south leg was extended to a length of 1,220 feet and that on the north leg 1,010 feet. A rib 20 feet to 30 feet high was left above the levels to take the place of timber covering, chute holes being put through at intervals of about 50 feet. Of the ore mined only about half was hoisted, the balance being held as reserve in the mine. From the south leg and 90 feet from the shaft a crosscut driven 500 feet to the south intersected five belts varying from 1 foot to 36 feet in thickness. The bromo-cyanide plant was operated successfully and gave an extraction of 70 per cent of the gold in concentrates running from $15 to $25 per ton. Considerable prospecting was done this year and some promising belts were opened on the East Gold Brook property acquired from F. S. Andrews and others.

The following is an abstract taken from the monthly statement of the Boston-Richardson Mining Company for August of this year:

Number of tons crushed	3,939
Number of tons concentrates produced	82·72
Value of ore per ton, determined by assay	$ 2 94
Value of concentrates per ton	17 00
Total value recovered	2 55
Cost of operation of mine per ton	1 08
Cost of operation of mill per ton	19
Cost of operation of cyanide plant per ton ore	10
Cost of cyaniding concentrates per ton concentrates	4 39
General maintenance of plant	53
Total cost of operation per ton	1 90
Average crushing per stamp per 24 hours ....tons	2·98

Stoping was done on the 400-foot level in 1907, but the levels were not extended in length. In January of this year an incline shaft 23 feet by 10 feet was started on the apex of the anticline from the 400-foot station. This was sunk 475 feet at an angle of 25 degrees, and at a point 360 feet from the 400-foot station levels were driven north and south; in September these were in 265 feet and 235 feet respectively. The concentrates averaging about $17 per ton were treated at an average cost of $2.33 per ton, and an extraction of 70 per cent to 80 per cent of the gold was made. A higher percentage of extraction could have been made, but the increase in the gold obtained would not equal the extra cost. The tailings from the cyanide plant, consisting of 40 per cent to 50 per cent gangue necessary for successful percolation, were reconcentrated by means of Wilfley tables so that they contained 39 per cent to 40 per cent arsenic. They were then shipped to Germany where they were paid for according to the arsenic content. Seven men were engaged in development work on the East Gold Brook property. A shaft 12 feet by 5 feet was sunk 175 feet, some crosscutting was done, and levels were driven, the longest one, 260 feet, being on the 8-foot south belt. In 1908, the main incline was continued to 700 feet, and ore was stoped from the 550-foot level, the south leg of which was continued to a length of 730 feet and the north leg 1,085 feet. The 700-foot level was driven on the south leg 181 feet. Owing to financial difficulties operations were discontinued on August 15, but were soon resumed.

In 1909, work was continued here by the New England Mining Company—H. S. Badger, superintendent—and on an average eighty-eight men were employed. Most of the stoping was done on the 550-foot level, the 700-foot level was driven on the south leg 629 feet during the year, making the total length 808 feet from the face of the shaft, and a raise was cut from the 700-foot level to the 550-foot level. Early in the summer an old 85-foot shaft in the western end of the company's property was cleaned out and at a depth of 75 feet a level was driven east 56 feet. A crosscut driven north from a point 6 feet east of the shaft cut two belts, one at 66 feet and the other at 72 feet, and on the former a level was driven 66 feet east. This company crushed, during the year ending September 30, 41,425 tons of ore yielding 5,024 ounces of gold, 82·6 per cent of which was recovered by amalgamation and 17·4 per cent by bromo-cyanide extraction from 1,171·5 tons of concentrate. Of the 588 tons of arsenical concentrate 446 tons were shipped to Swansea, Wales.

The operations of the New England Mining Company with John Warner as superintendent at the Richardson mine proper during 1910 were confined mainly to stoping and drawing developed and broken ore. A crosscut south from the vertical shaft at a depth of 170 feet cut a 6-foot belt at the shaft and a 7-foot belt at a distance of 86 feet. On August 23 a cave in the upper part of the old workings on the north side of the fold resulted in an increase of water and a discontinuance of work. It was estimated that at the time of the cave 1,500 tons of broken ore remained on the 550-foot level, and 4,000 tons of broken ore and 1,000 tons of unbroken developed ore on the 700-foot level. In the west block levels were driven at a depth of 75 feet on the shaft belt 56 feet east and 85 feet west. A crosscut driven north 178 feet cut four belts at distances of 35 feet, 85 feet, 112 feet, and 160 feet. On the first of these a level was driven east 575 feet and on the fourth a level was driven west 80 feet. The results were unsatisfactory. In the east block a vertical shaft was sunk 202 feet east of the old east block shaft. It struck No. 3 belt at a depth of 100 feet and sinking continued 40 feet on the belt. From 36,940 tons of ore 4,063 ounces of gold was recovered, of which 715 ounces was recovered by the bromo-cyanide treatment of 956 tons of concentrates. Arsenical concentrates amounting to 529 tons were shipped to Wales. Operations were conducted on a small scale in 1911 and 1912 and in 1926 the Metals Mining and Smelting Corporation of Canada, Limited, took over the property and treated the tailings to recover the auriferous arsenopyrite. The treatment of tailings was continued in 1927.

The discovery of the large Richardson belt in 1892 did much to stimulate prospecting along the same anticline and considerable exploratory work has been done, but it has resulted in very little profitable mining.

Two leads were opened on the H. Richardson property at the east, and in 1903, Howard Richardson reported a small recovery of gold.

The chief exploratory work was carried on west of the Richardson property. Several shafts were sunk on the North and South leads dipping south on the McMillan property, but no great depth was attained.

important operations were carried on for a time on Dolliver mountain. More or less prospecting was done here in the nineties and in 1896 returns were made of 69 ounces recovered from 155 tons.

In April, 1901, the Dolliver Mountain Mining and Milling Company, Limited, was organized, with G. J. Partington as vice-president and general manager. This year twelve men were employed, chiefly in prospecting and development work on the surface, but it was the intention of the company to push the sinking of a vertical shaft, which had been sunk to a depth of 60 feet, the purpose being to develop and mine belts of ore that would be cut during the sinking on the anticline.

Surface work progressed rapidly and waterpower was developed; at the time of the inspector's visit in 1902, two dams had been constructed as well as a sluice and 44-inch flume to carry water to the powerhouse 4,000 feet from the lower dam. A 16-inch McCormick turbine was put in as well as an electric plant, and electric power was transmitted to the shaft for hoisting. An air compressor was also erected and a foundation laid for eighty stamps. The shaft, measuring 17 feet 6 inches by 4 feet 6 inches inside timbers, had been sunk to a depth of 190 feet and at a depth of 130 feet had cut a belt of ore 32 feet thick, named the Partington belt.

In 1902, the shaft was deepened to 265 feet, cutting a 22-foot belt named the Forge belt. A station was cut on the Partington belt and levels were driven on the north and south legs 150 feet and 200 feet respectively. An air shaft was started on the south leg 450 feet west of the main shaft to connect with the level being driven. Forty stamps were erected and crushing began in June, the tailings being concentrated by four Wilfley concentrators. This year returns of 170 ounces were made from 6,326 tons of ore.

In 1904, this company took advantage of the act passed by the provincial government by which a part of the cost of sinking a deep shaft was to be paid out of the public purse in order to test the feasibility of carrying on deep mining operations. On May 25, the work was commenced under conditions imposed by the Commissioner of Mines. At this time the shaft was down 330 feet and sinking was continued to a depth of 488 feet. Since the inspection in 1903, the south level on the Partington belt was extended to 645 feet and at 583 feet a raise was made to the air shaft. The level on the north leg was extended to 204 feet, and ore was stoped from both levels. A station was cut on the Forge belt and levels were driven, south 180 feet and north 194 feet, but little stoping was done. Crosscuts were driven from this station to the Partington belt, on which short levels were driven. The returns for this year were 205 ounces from 8,059 tons.

Sinking under the Deep Mining Act was discontinued, and, in 1905, from the bottom of the 488-foot shaft a drill hole was put down 500 feet along the anticlinal axis, and, although several bodies of quartz and slate were struck, the results were not satisfactory, and shortly after this the mine was allowed to fill with water, and has since remained idle.

The production for this district is given with that of Isaac Harbour.

VOGLERS COVE

Voglers Cove mine lies in the southwestern part of Lunenburg county 2 miles north of Voglers Cove, a village on Port Medway harbour. The village is 8 miles from County Line station on the Canadian National railway.

The vein on which the most of the work has been done lies about a mile south of the axis of the Indian Path anticline running southwest. The Goldenville formation is exposed and the strata strike 40 degrees and dip south 60 degrees to 70 degrees. The vein is a cross vein running north (magnetic) for some distance, then turning and running 335 degrees (magnetic). It dips west 75 degrees. It[1] is 2 feet thick, but increases to 9 feet at the point where it changes its direction. Towards the south it splits into two parts 18 inches and 2 feet wide. The pay-streak is 2 feet wide and dips north 30 degrees, is well mineralized, and carries visible gold. The thick part of the vein is not good. Another vein on which a shaft has been sunk 50 feet lies 650 feet northeast, is 10 feet thick, runs northwest, and is nearly vertical.

According to newspaper reports some prospecting was done here during the eighties. The discovery of the principal vein is credited to Augustus Reinhardt.

---

[1] Rept. Dept. of Mines, N.S., 1904, p. 74.

The Report of the Department of Mines for 1895 states that at that time there was a 5-stamp mill, and a little gold had been reported two or three years before. In 1899, J. Munroe was in charge of work on a narrow vein on the 'mill site' property on which a shaft had been sunk and levels were being driven. There was a 5-stamp mill on the property. On the Liverpool Company's property, Messrs. Brown, Crowe, and Hutt had some men employed sinking a shaft. Levels were driven in 1901, and in 1904 mining operations were being carried on by the Vogler's Cove Mining Company—A. B. Stewart, manager—but ceased late in the year. The main shaft[1] is 125 feet deep. At the bottom of this a level is carried 30 feet south, and at a depth of 90 feet levels are carried north 40 feet and south 60 feet. Thirty feet south from the main shaft is another one 70 feet deep, from the bottom of which a level is run 35 feet south.

A mile and three-fourths northeast of this is the Dr. Cowie mine. Two shafts, 45 feet and 50 feet respectively, have been sunk on a slate belt carrying three quartz leads. Half a mile east of this is another 50-foot shaft on the same belt. This dips south 45 degrees and is about 1,000 feet south of the anticlinal axis.

WAVERLEY[2]

Location

Waverley gold district is situated in Halifax county, 12 miles north of the city of Halifax and 2 miles from Windsor Junction. There is a station in the district on the Dartmouth branch of the Canadian National railway. Lakes Thomas and William divide the district geographically into two parts known as East Waverley and West Waverley.

Geology

The anticline[3] exposed here is the western continuation of the Moose River anticline, runs north 80 degrees east (magnetic) and plunges west at angles varying from 0 degrees to 35 degrees. It is an unsymmetrical fold with the north limb dipping north 70 degrees and the south limb dipping south 45 degrees. Denudation has been so extensive as to expose strata deposited 7,000 feet below the Halifax formation.

There has been considerable faulting. The principal fault passes up lake William and lake Thomas and passes immediately to the west of the short run uniting the two. The horizontal displacement is 800 feet to the south on the east side of the fault. Another fault giving a shove of 118 feet to the south on the east side runs by the railway station and through Muddy pond. It dips east at an angle of 40 degrees and has been located in the underground workings of the Lake View mine. Another line of disturbance was located by surface trenching at the southwest cove of lake Thomas, but the displacement does not appear to be extensive. In the western end of the district is another probable fault passing through Threemile lake and Powdermill lake.

Character of the Deposits

The veins follow the planes of stratification. Although quite a little work in the western section was conducted on the south limb of the anticline and numerous shafts were sunk on the Nigger, O'Toole, and South Tudor leads, the high dip on the north limb seems to have furnished conditions more favourable for the deposition of ore-bodies, and nearly all the important veins are situated on this limb. Here a series of veins lying in a zone 600 feet wide has been worked for a considerable length and to depths in many places between 200 and 350 feet. Some, especially those to the north, were found to decrease in size and value, thus indicating the northern limit of the pay-zone. A shaft sunk 628 feet on the dip of the Dominion lead showed a decrease in thickness from 15 inches on the surface to a mere film of quartz with lenticular pockets at a depth of 500 feet. The pay-zone probably lies parallel to the

---

[1] Rept. Dept. of Mines, N.S., 1904, p. 74.
[2] Plan published.
[3] Faribault, E. R.: Geol. Surv., Canada, vol. XI, pt. A, p. 151.

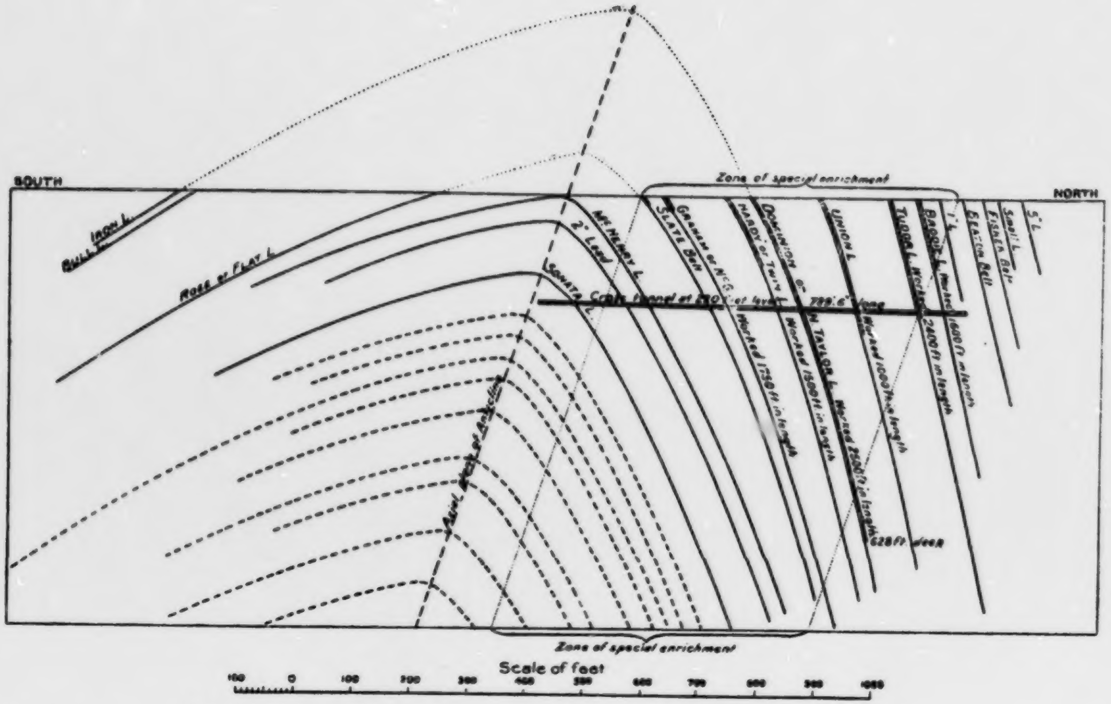
SOUTH
NORTH
Iron L.
Bull L.
Rose or Flat L.
McHenry L.
2' Lead
Sonata L.
Cross tunnel at 250 feet level 799' 6" long
Slate Belt
Graham or McG.
Worked 1750 ft in length
Hardy or Twin L.
Worked 1500 ft in length
Dominion or N. Taylor L.
Worked 2500 ft in length
628 ft deep
Union L.
Worked 1000 ft in length
Tudor L. Worked 2400 ft in length
Brodie L. Worked 1600 ft in length
1' L.
Beaton Belt
Fisher Belt
Small L.
5' L.
Axial plane of anticline
Zone of special enrichment
Zone of special enrichment
Scale of feet
100
0
100
200
300
400
500
600
700
800
900
1000

Figure 10. Section across anticlinal fold on Tudor mine, Waverley gold district.

axial plane of the fold dipping south at an angle of 69 degrees. Among the most important leads worked in the western section are the Tudor, Brodie, Union, Dominion, North Taylor, Twin Taylor, No. 9, and No. 6.

In the eastern section the Barrel lead on Laidlaw hill is the only one of importance. This lead aroused a great deal of interest at the time of its discovery on account of its supposedly unique structure. This was found to be a sheet of quartz lying on the apex of the anticline dipping north and south and plunging to the west, but the peculiarity that attracted attention was its corrugated appearance, where it was exposed after the removal of 2 or 3 feet of drift. Corrugations resembling the logs of a corduroy road ran parallel to the anticline and were found to continue beneath the overlying rock. Another interesting feature[1] of this vein is that where it was exposed a strip 25 feet long by 8 or 10 feet wide had the rolls or barrels planed off by glacial action, and the smooth and polished surface was crossed by the striæ continuous with those found on country rock on each side.

History

Waverley was one of the first districts discovered and it quickly rose into prominence as one of the principal producing districts of the province. Mining was very active during the sixties and early seventies, then interest waned, and it was only during the early nineties and the first three years of the present century that production again assumed any noticeable proportion.

The first discovery of gold in this district brought to the notice of the public was made by Alexander Taylor on August 23, 1861, on the edge of Muddy pond on the Waverley farm also known as the Allen farm. When the discovery became known it is said that the Hon. Joseph Howe drove to the locality, made investigations, and returned to Halifax with $90 worth of specimens acquired from men who had broken them from the boulders during a two day's search on American hill. The next day there was a rush of gold hunters to Waverley. An association of Halifax merchants, called the Chebucto Mining Association, was formed to make a thorough and systematic prospect of the Waverley farm, on which the exclusive right to search until May 1, 1862, had been acquired. Although this farm included all of what is now known as the west division of Waverley district and by far the greatest number of auriferous veins, the company was unsuccessful in discovering any lodes sufficiently auriferous to warrant the taking up of any large area. On May 1, 1862, Alexander Taylor, however, exposed a gold-bearing vein at the place where he had discovered the boulders the preceding year.

The discovery of other veins east of Muddy pond quickly succeeded and soon active mining was carried on here. The most important vein here in the western division was the Taylor vein, which was first found on the free claim, selected by Taylor as discoverer. On the free claim a 40-foot shaft was sunk in 1862, including the Taylor and another vein 3 feet to the north, but the most of the ore was procured by open-cut. The same vein was opened on the area to the east by two shafts one of which was 90 feet deep. Immediately to the south several veins were opened by the Wolfville Company, and operations were carried on on the same ridge of ground on the side of lake Thomas by the Nova Scotia Gold Company, and in a width of about 80 feet over twenty veins were exposed. No fair test, however, was made of these veins during the year. Some prospecting was done west of Muddy pond, but no veins of any consequence were discovered. Mining in the western division thus assumed no great proportions in 1862, and from 149 tons of ore 147 ounces of gold was recovered.

In the eastern division, on the other hand, extensive mining operations were carried on during this year. Gold was discovered on Laidlaw hill by James Skerry on September 14, 1861. His attention was first attracted to some loose auriferous quartz boulders embedded in drift about 3 feet deep, and on clearing away the loose material he discovered what he supposed to be a very wide vein of quartz. Subsequent examination showed that it was the apex of a folded and corrugated quartz vein. It was described by some as presenting the appearance of logs laid side by side like a corduroy road, and by others as resembling a series of small casks laid side by side and end to end and from this resemblance it was designated 'barrel quartz,' a term familiar to every gold miner of Nova Scotia. This barrel quartz received considerable attention in 1862, and was traced west 800 feet. To test its extension north two shafts, 36 and 55 feet deep, were sunk north of Willis brook, but the vein was not reached; its southerly extent was not tested. Mining was carried on by open-cut and during the year 6,592 tons of quartz was removed, of which 3,592 tons were crushed, yielding 1,360 ounces of gold. In 1863, 471 ounces were recovered from 2,370 tons of quartz.

---

[1] Wilson, B. C.: Trans. Min. Soc., N.S., vol. II, pt. I, p. 60.

During the next three years there was a steady increase in the production of the district and in 1864 it greatly exceeded that of any other district; in 1865 it amounted to 14,404 ounces from 12,518 tons, considerably more than half that of the whole province.

No details regarding the operations during 1863-5, inclusive, are given by the Chief Gold Commissioner or the Chief Commissioner of Mines, but F. P. Ronnan[1] has assembled some interesting information relative thereto. In 1863, an average of twenty areas were worked and among the principal operators were a number of German capitalists, including Messrs. Müller, Burkner, Franck, and Ellershausen, the last being manager of a number of areas formerly held by the Chebucto Mining Association on American hill. Thomas L. DeWolfe was manager for the Lake Major Company and the Rockland Mining Company, and operations were conducted on a small scale. The average number of mines worked during the first three months of 1864 was eighteen; this increased to thirty during the second quarter, but fell back to ten during the remainder of the year. There were six mills in the district and among the companies at work, one of the principal was the Rockland Company, which sank seven shafts on the Tudor lode, six on the Brodie, and six on the Union. Of the 14,404 ounces produced in 1865, over half was produced by Leopold Burkner who conducted vigorous operations on the Tudor lead on areas 161-165 inclusive. A yield of 8,727 ounces of gold was obtained from 7,000 ounces of quartz crushed at his mill. Other companies engaged in mining at Waverley during this year were the Waverley and Boston Company, the Taylor Gold Company, and the North American Company.

In 1866, the most extensive workings were on the Tudor lode. On this Burkner and Company continued stoping and sinking and their deepest shaft reached 226 feet; to the east the Lake Major Company had nine shafts varying in depth from 198 to 251 feet, and still farther east DeWolfe and Company had seven shafts, the deepest of which was 160 feet. The Brodie lode to the north was worked by all three companies, and the last-named company also worked the Taylor lode east of Muddy pond by two shafts 100 and 130 feet deep. South of the Taylor lode, the Boston and Nova Scotia Company sank four shafts on No. 6 lode, one of which was 180 feet deep, and on the same lode farther east the Waverley Company raised ore through a 140-foot shaft. The latter company also worked a little on No. 7 lode. Another lode that received some attention this year was the Nigger lode and on it the Stanford Company sank four shafts and started driving levels. Work was resumed this year by DeWolfe and Company, on the barrel quartz on Laidlaw hill, which had been virtually abandoned three years previously.

During 1867, work was still carried on by Messrs. Burkner, DeWolfe, and Company, on the Tudor lead, but not so extensively as formerly. They also worked the Brodie lead and DeWolfe and Company made a drainage crosscut from one of their shafts on the Tudor lode to the Brodie lode. Mr. Burkner sank additional shafts on the Nigger lode and extended his operations on it. Little was done this year on the Taylor lode, but mining continued on the barrel quartz, and the Boston and Nova Scotia Company continued operations on No. 6 lode, extending their main shaft to a depth of 300 feet.

In 1868, the production was less than in 1867, and in that year Waverley lost the distinction of ranking first among the gold districts of the province. This year the lodes chiefly worked were the Tudor, Brodie, No. 6, and Taylor. The deepest shaft on the Tudor lode on the Lake Major property was 325 feet deep, and on the Brodie lode 220 feet. Mr. Burkner's work was chiefly of an exploratory nature. The Boston and Nova Scotia Company, after continuing their shaft on No. 6 lead to a depth of 361 feet and stoping a portion of the vein, closed this mine, and directed their attention to the North Tudor lode. To arouse renewed interest in this district and to place in the hands of the miners information that would enable them to carry on their exploratory and development work more intelligently and systematically, Henry Youle Hind was commissioned to make a report on the district. This able report, accompanied by geological maps and sections, was published in 1869 and contains valuable information on the geology of the district, the nature of the ore deposits, the degree of development of the different properties, and hints as to how to carry on the work of mining more economically.

---

[1] Ind. Advocate, May, 1898, p. 6.

In 1869, operations were carried on by the Lake Major, Rockland, American Hill, and Waverley Gold Mining companies and by Leopold Burkner. Professor Hind's map of the geological structure of the district was confirmed by the tracing of the Tudor lead around the apex of the anticline and along the south limb a distance of 1,100 feet. On this South Tudor lead, Mr. Burkner sank five shafts and removed the ore by underhand stoping; he also resumed operations on the Nigger lode, sinking three shafts. A little work was done late in the year on the barrel quartz. The work of DeWolf and Company was chiefly of an exploratory nature, but on areas adjoining their property the North American Company sank a shaft and stoped a portion of the North Tudor lode. Some little work was done east of Muddy pond, the Waverley Company doing a little stoping on the North Taylor lead, and the Boston and Nova Scotia Company and the Taylor Company, united under the name, The American Hill Company, continued on the lodes they had formerly worked.

In 1870, the production was the lowest that had yet been reported, being only 811 ounces of gold from 2,619 tons of ore. Among the companies engaged were the Lake Major and Rockland companies under the superintendence of Thos. L. DeWolfe, and the American Hill and Waverley companies under the superintendence of W. H. Clarke. In the early part of the year, Mr. Burkner worked the Nigger lode, a few tons of quartz was mined on Laidlaw hill, and late in the year mining was resumed on the Tudor lode. The North American Company sank on the North lode and stoped it. The American Hill Company worked the North and South Taylor leads and DeWolfe and Company resumed operations on the Union lead.

The American Hill Company worked the North Taylor lode in 1871, but the next year let their property to tributers who did some stoping on No. 6 lead. DeWolfe and Company, during 1871 and 1872, worked first the Union lode, then the Brodie, but finally abandoned the latter and returned to the former. Early in 1873, however, DeWolfe and Company abandoned all work and in the autumn the property containing the Union lead was let to tributers. During this year tributers were active on the American Hill property and also on Wilson's areas on Laidlaw hill. During 1874, tributing continued on Laidlaw hill, but was suspended on American hill, and Mr. McClure set his men to search for the continuation of the Union lead to the east. This was found, and yielded good returns.

Not much gold was taken from Laidlaw hill in 1875, mining being confined chiefly to the western division. Here the Union lead was worked on Mr. McClure's property adjoining that of DeWolfe. Some explorations were made on areas 174 and 191, but the Union lead on areas 169 and 170 was worked steadily and under Mr. Huff's management two shafts were sunk to a depth of 140 feet and ore stoped out that yielded very satisfactory returns. This year a company known as the British Gold Mining Company took Mr. DeWolfe's property conditionally, put the stamp mill in repair, and put in working order five shafts on the Tudor lead, four on the North, and seven on the Union, but apparently with little success.

The principal work of the district in 1876 was on the Union lead, areas 169 and 170, where sinking on the main shaft was continued and stoping actively performed. Some stoping was done on the Dominion lead, and a little work on American hill, and the Barrel lead, area 156, was worked along the wall, the waste rock being stowed tight to the roof behind the miners.

In 1877, the production fell off considerably, much more in 1878, and for a number of successive years it remained very low. In 1877, work continued steadily on the Union lead, area 169, and for a time on the Dominion lead. Work, started the preceding year on American hill, was continued and the Graham lead was cut, but the results were disappointing. During this and the following year some tributers found a few rich barrels on Laidlaw hill, but work in this vicinity was almost completely suspended for a number of years.

In 1878, mining on the Union lead, area 169, was abandoned and the North Tudor or Brodie lead was opened on area 133, but little seems to have been done. In 1879, there was little activity in the district, the barrel quartz was tested by a shaft on area 113, the Wilder Brook and Johnstone lodes and some lodes on the Burkner property were tested, and T. J. Wallace reopened the mine on the lake shore and put up an 8-stamp mill. In 1880, a lode on the Burkner areas was stoped a length of 180 feet to a depth of 30 feet; Mr. McClure found a promising 15-inch lode to the west of his mill, and some other prospecting was done. A mill was erected during the summer for treating tailings, but work was suspended in the autumn.

In 1881, the lode found on the McClure property the preceding autumn was mined, and a little work was done by O'Toole and others. The next year work was continued on the McClure areas, and Mr. Huff found a promising lead on area 250. Little progress was made in 1881 in the treatment of tailings in this district, but the operation was more successful in 1882.

The district was greatly depressed during the eighties, but in 1885, Mr. Huff discovered a vein on American hill which he worked this and the following year. In 1887, Messrs. Wilson and Gue met with a fair measure of success in opening up new portions of the Dominion and Taylor leads. In 1888, a little milling was done and the largest returns were made by Messrs. McClure and B. C. Wilson. Late in the year preparations were started by Mr. Hayward for extensive operations on American hill.

Some time during 1888, work was started on a long tunnel to cut the barrel quartz on Laidlaw hill. The tunnel was started near the water level close to the road leading to Truro and was carried eastward. Work on this tunnel was carried on in a more or less desultory fashion for several years, but on November 14, 1892, the barrel quartz was struck after the tunnel had been driven 640 feet. It was, however, several years after this before mining on the barrel quartz was resumed with any degree of activity.

In 1889, Mr. Hayward continued enlarging the 360-foot shaft, crosscutting and doing other development work on American hill for the Lake View Mining Company, Limited. Only a small amount of gold was reported for this year and most of this was produced by the Palgrave Gold Mining Company.

In 1890, the Lake View Mining Company's property was equipped with an expensive plant including a 30-stamp mill and eight Frue vanners, and 349 ounces 15 pennyweights of gold was extracted from 3,041 tons of ore. Early in 1891, it is said, the company concluded that the ore was too low grade to pay and work ceased, though the mine was kept pumped out and later was leased to A. A. Hayward, and during this year 529 ounces of gold was extracted from 1,271 tons of ore. In 1892, however, Mr. Hayward ceased work and the mine was let to tributers.

In 1890, the Palgrave Gold Mining Company reported some gold from the Union lode, but next to the Lake View Mining Company, Limited, the principal producer was the Windsor Junction Gold Mining Company. This company worked on the old DeWolfe property under the management of Capt. McDuff, made small returns in 1891 and 1892, but closed down early in the latter year.

In 1891, the Sophia Mining Company did some work on the Tudor and Nigger lodes of the old Burkner property, but did not meet with much success. This year saw the incorporation of a company that once more made Waverley one of the more important gold-producing districts of the province—the West Waverley Gold Company. This company acquired the old McClure property and early in 1892 had a 10-stamp mill at work. This mine, under the management of J. E. Hardman, made steady returns, and in 1893 ten more stamps were added to the mill. During the latter year sixty men, under the management of H. F. Putmer, continued crosscutting and stoping the Dominion and Tudor leads. The property passed into the hands of the Tudor Gold Mining Company, Limited, in 1894, and operations continued. In 1895, forty-five men were employed under the management of J. E. Hardman. This year the shaft on the Dominion lead was 500 feet deep and the Tudor, Graham, and Hardy leads were all cut at a depth of 225 feet. This company made returns in 1896, but in 1897 returns were made by tributers only.

Later on, the mine on Laidlaw hill came in for some attention and in 1895 some work was done by B. C. Wilson. During 1898 and 1899, the Tunnel Mining Company was the chief producer of the district. In the latter year, J. G. McNulty had sixty men employed here, chiefly on the north limb of the anticline. In 1900, this mine was worked by the Waverley Gold Mining Company—J. G. McNulty, manager—and the work was done chiefly on the north limb of the anticline, where four levels were driven, of which the upper two were drained by the long tunnel running to the west. The ore was raised through shafts and stoping was vigorous. During this year a 60-stamp mill was erected and four Wilfley tables were put in to save the auriferous sulphides. The whole plant, including mill, concentrators, air compressor, and electric light plant, was run by waterpower, brought from Fall river, 2 miles distant, by ditch and flume. In 1901, McNulty had one hundred and sixty men on the pay-list, the main shaft had reached a depth of nearly 500 feet, a fifth level was started, driving and stoping were carried on, and enough ore taken out to supply work for twenty to thirty of the sixty stamps and two of the four Wilfley tables. In 1902, E. H. Emerson was manager at this mine and had seventy men employed and vigorous operations were carried on. Unfortunately work ceased during a part of the summer owing to lack of available waterpower. Work was resumed later and continued into the next year, when the mine was again closed through lack of power. Operations at this mine during the years 1901-1903, inclusive, again placed Waverley among the more important producing districts of the province, and during these three years over 7,700 ounces of gold was recovered from this one property, from about 28,000 tons of ore.

Other work was done during these years, but little was produced besides what the Waverley Gold Mining Company reported. In 1901, W. Temple, working on some areas adjoining the property of the Waverley Gold Mining Company, sank a shaft 165 feet deep and at a depth of 145 feet cut the barrel quartz vein. The next year he drove a level on the vein about 168 feet long, and in 1903, this property was worked under the same management as that of the Waverley Gold Mining Company. Some returns were also made in 1901 and 1903 by the Tudor Gold Mining Company.

In 1901, a cyanide plant was erected by Sydney Smith, but after treating 2,000 tons of tailings it was shut down, not enough gold being extracted to make it pay.

General Development

The extent of operations is well indicated on the published plan for which the survey was made in 1898. In many veins, as the Brodie, North Taylor, and a portion of the Tudor, the ore has been reached by a great many shafts, whereas in other veins, as the Dominion, and No. 6, the ore has been removed to a great extent by means of one deep shaft on each. There has been a small amount of crosscutting, and on American hill a crosscut driven north from the 340-foot level of No. 6 was used in the removal of ore from the Twin Taylor and North Taylor lying to the north. On the West Waverley property a crosscut extending 729 feet south from the Brodie lead was driven at a depth of 225 feet and cut ten lodes, two of which do not outcrop on the surface.

The Barrel lead was for some time removed by open-cut, then, as has already been pointed out, a tunnel 670 feet long was driven from the level of lake Charles to cut the apex of the saddle and a rise was made on the vein. Levels were driven north and south, but the main operations were limited to the north leg of the saddle. On this leg a shaft was sunk on an inclination of 53 degrees to a depth of 465 feet. From this shaft five levels have been run, the first two a good distance to the east, and on the west side as far as the apex, and also a considerable distance around on the south leg; levels 3, 4, and 5 are carried to the west about to the apex of the fold. From a shaft sunk on the south leg and known as No. 2 South, as well as from No. 2 North, sunk on the north leg 300 feet east of the main shaft, some levels were driven, but the greater proportion of the work was done from the main shaft.

There is still room for much exploratory work in this district. Surface prospecting might be directed to that portion of the district lying between the Lake View mine and the barrel quartz vein on Laidlaw hill.

Then as regards underground explorations, Faribault, in a report to the Deputy Commissioner of Mines, Halifax, dated July 28, 1909, has recommended crosscutting towards the anticline from deep shafts on the north limit of the zone of enrichment with the driving of levels on the most likely veins in order to reach the pay-shoots. This, it is thought, would open up portions of veins lying in the zone of enrichment. The following two suggestions are made:

(1) From the bottom of the Hardman shaft on the Dominion lead, reported to be 628 feet deep, a crosscut should be driven 500 or 600 feet south. This would cut the Hardy, Graham, Slate, McHenry, and Sonata leads already known on this property, also leads outcropping between the McHenry and the anticline on the Lake View property on the eastern side of the Muddy Pond fault, as well as other underlying veins not exposed here.

(2) The main shaft on No. 6 on the Lake View property, now 340 feet deep, should be sunk 90 feet deeper to the Muddy Pond fault, which dips east at an angle of 40 degrees and runs about at right angles to the strata. A crosscut driven along this fault north 125 feet and south 500 feet would intersect the veins lying on each side of the fault. It is reported that no trouble has been experienced from water in the crosscut already driven 230 feet along this fault at the 340-foot level, and there is still less likelihood of trouble at the 430-foot level. The advantage of following the fault will be more apparent when it is remembered that the displacement of the leads 100 feet to the north on the east side of the fault is not due to a simple horizontal movement, but to an upward and westward movement of the eastern block relative to the western block, a reversed fault. This explains why the apparent horizontal displacement of the leads and of the anticline axes is in opposite directions, as shown on the plan. The extent of the movement is not known and no calculation can be made of the displacement of the pay-shoots, but they are found at a higher level on the east side than on the west. More definite ideas as to the extent of movement may possibly be obtained from observations in the crosscut along the fault.

The Dominion lead lying 25 feet north of No. 6 has been worked for a length of 230 feet on the 340-foot level to the western boundary of the Lake View property, and it is probable that it will be found to carry pay-ore at the 430-foot level. At this level the Dominion and all other veins on the west side of the fault would have a length of about 370 feet to the western boundary of the Lake View property.

There is also room for explorations in other parts of the district. The ore-shoots in the Tudor and neighbouring leads may extend farther west than they were worked in the early days. Although diamond drilling on the apex of the fold on Laidlaw hill gave no very encouraging results it may be that a crosscut driven from the bottom of the main shaft on the Barrel quartz lead towards the anticline would cut some paying veins.

Production

Year	Total ounces of gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1862	1,507	0	0	3,741		8	1
1863	2,380	6	3	6,754		7	1
1864	4,491	3	0	6,979		12	21
1865	13,102	0	21	10,709	1	4	11
1866	10,486	0	21	17,286		12	3
1867	4,134	18	17	11,289		7	8
1868	3,542	17	7	9,127		7	18
1869	1,591	14	10	3,915		8	3
1870	811	3	21	2,616		6	4
1871	1,427	18	12	2,772		10	6
1872	1,032	4	0	1,761		11	17
1873	1,009	0	0	2,013		10	0
1874	1,553	12	15	1,682		18	11
1875	1,740	1	0	1,313	1	6	12
1876	1,539	7	0	1,661		18	12
1877	866	18	10	1,422		12	4
1878	498	12	8	1,197		8	8
1879	116	11	1	442		5	7
1880	156	13	15	346		9	1
1881	374	0	0	535		14	0
1882	234	7	5	554		8	14
1883	46	3	0	96		8	12
1884	1	7	0	10	1	7	0
1885	170	2	6	223		15	2
1886	329	2	0	508		12	22

Production—Continued

Year	Total ounces of gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1888	232	9	10	619		7	12
1890	482	12	0	3,509		2	18
1891	602	4	0	1,611		7	11
1892	906	11	4	3,154		5	17
1893 (9 months ending Sept. 30)	1,529	6	0	5,509		5	13
1894 (year ending Sept. 30)	1,860	1	0	9,310		3	23
1895	1,540	2	0	6,315		4	21
1896	534	17	12	2,560		4	4
1897	461	8	0	806		13	7
1898	504	13	11	807		12	12
1899	75	7	12	181		8	7
1901	2,903	4	14	8,908		6	12
1902	3,049	14	0	11,789		4	20
1903	1,853	14	16	7,795		4	18
1904	No crushing						
1905	2	4	15				
1915	5	18	0	36			
1918	1	7	0	(Mortared)			
	69,688	19	22	151,862½			

WESTFIELD

Westfield is situated in the northeastern part of Queens county, about 4 miles northeast of Caledonia, a station on the Canadian National railway.

At this place[1] there are a number of interbedded quartz veins lying in the upper portion of the Halifax formation. The rocks are black slates with a few beds of rather siliceous material. The veins consist of quartz "reefs" 20 to 30 feet thick, and both the veins and the rocks carry more or less pyrite and mispickel.

A discovery[2] was reported from Westfield in 1888, and it is reported that a shaft was sunk 40 feet deep on the Jumbo lead which is 20 to 75 feet wide. This is the only lead worked. Some further work was done in 1895, and the shaft is said to have been continued to a depth of 70 feet. The vein attracted more attention on account of its size than on account of its gold content.

WHITEBURN [3]

Location

Whiteburn gold district is situated in the northwestern part of Queens county, 6 miles southwest of Caledonia, on the Canadian National railway.

Geology

This district[4] lies in the centre of an elliptical area of quartzite rocks of the Goldenville formation about 8 miles long by 3 miles wide and extending from Cameron lake to the head of lake Rossignol. At Whiteburn, the axis of the anticline runs northeast and the strata dip at low angles, 40 degrees to 50 degrees on the north limb and 10 degrees on the south limb. The district is characterized by the small amount of slate interbedded with the quartzite. The absence of these slate belts makes it necessary to pursue mining operations in the quartzite and the cost of mining is thus much increased. On the north limb of the anticline occurs a subordinate fold with axis probably running northeast from the axis of the main fold, and it is on this subordinate fold that much of the mining has been done. There is also a subordinate fold on the south limb of the anticline, which seems to have favoured ore deposition.

---

[1] Geol. Surv., Canada, Ann. Rept., vol. IX, pt. M, p. 138.

[2] Rept. of the Dept. of Mines, N.S., 1888.

[3] Plan published.

[4] Geol. Surv., Canada, Ann. Rept., vol. IX, pt. M, p. 148.

Character of the Deposits

The deposits lie on the eastern end of the dome, and the area opened extends 1½ miles east and west and one mile north and south. The most important are found on the subordinate fold on the north limb, and are interbedded. The following leads, given in order from south to north, are the principal ones: Gammon (4 inches), South (5 inches), Cellar (5 inches), Rusty (3 inches), Battery (3 inches), North, and Dunbrack. West of these a number of leads have been worked on the old Rossignol property. The Corrigan lead on the Banks property lies on a subordinate fold in the southwestern part of the district. It is 1 to 5 inches thick, runs south 5 degrees east (magnetic) for some distance and then turns southeast, and on the apex of the flexure it carries rolls dipping southwest at a low angle.

History

Whiteburn is one of the more recently discovered gold districts and for a few years assumed considerable importance as a producer, the yield for each year from 1887 to 1889 inclusive being in the neighbourhood of 2,500 ounces; whereas for 1890 and 1891 it was a little over 800 ounces.

Prospecting began here in 1884 and the next year mining operations were carried on. The Messrs. McGuire opened a lead to a depth of 20 feet and took out some quartz yielding 17 ounces per ton. Arrangements were made to erect a stamp mill. Prospecting was done north of McGuire's property by Messrs. Hall, Owen, Barss, Cole, Telfer, and Annand and about ten veins were opened varying from 4 to 12 inches in width. Trial crushing from some of the larger veins gave a yield of 3 ounces per ton.

During the early years of Whiteburn's history transfers of property were frequently made and from the available information it is almost impossible to follow the operations of the different companies or to know the exact location of their works. In 1886 prospecting was continued and a number of new leads were opened. The McGuire Bros. opened another lead on their property and a new lead discovered west of McBride hill turned out some good looking quartz. Two new mills were erected: one on the Parker-Douglas property and one, known as the Foster mill, on the Parker, Cole, and Wile property. During 1887 three mines and mills were at work, the success of the work on the McGuire lead stimulating effort on their properties. In 1888 two veins on the McGuire property were successfully mined under the management of R. R. McLeod. Operations were also conducted by Mr. Graves on the property to the north, and the continuation of the north McGuire vein was cut by a vertical shaft and worked for a while. This is the property formerly known as the Parker-Douglas property, and was probably owned this year by the Whiteburn Mining Company, a company that returned half the production of the district, and continued to make returns for the two succeeding years. The Cushing property was idle during 1888, but some finds were reported from near Corrigan lake. The McGuire mine yielded 1,028 ounces from 290 tons of quartz in 1889, but closed down at the end of the year. The Whiteburn Mining Company also carried on important operations, worked several veins, and reported 1,412 ounces of gold from 1,022 tons of ore.

This mine was also closed and during the first part of 1890 the district was almost idle. A number of transfers of property were made this year. The old Cushing property was acquired by the Rossignol Mining Company and the work was started late in the year. The McGuire property was reopened by the Queens County Mining Company, and the Whiteburn Mining Company's mine was reopened under new management, the latter doing the most extensive mining during the year. This company also made the largest returns in 1891, during which year small returns were also made by the Rossignol Mining Company. On the property of the latter company some twenty men were employed, and about forty men were engaged in prospecting by the Whiteburn Mining Company under the management of Mr. Partinger.

Except for a little tributing the district was idle during 1892 and no returns were made. The year 1893, however, saw a revival in the industry, and returns of considerable importance were made by the Rossignol Mining Company and Queens County Mining Company, and less important returns were made by J. L. Graves and K. F. Crocker. At the time of the inspector's visit in September this year, the Crocker Mining Company—Kendall F. Crocker, manager—had twenty-five men employed on the old McGuire property, and Alex. Gordon had eight men trenching on the property of the Whiteburn Mining Company.

Since then work has been of a very desultory nature and only small returns have been made. In 1897 a little crushing was done at the Whiteburn mill, but the district was generally idle. In 1900, 1901, and 1902, J. W. Lowe made small returns and from 1903 to 1906, inclusive, small returns were made by C. T. Crocker.

General Development

Little information on this point is available except a few notes got by Faribault in 1903. On the West or old Rossignol property ten leads were worked, several shafts were sunk 100 feet, and one 150 feet. The McGuire North lead was worked on the Crocker property 300 feet deep on the dip and 500 feet in length. The Rusty lead was worked 62 feet in depth and 400 feet in length, the South 200 feet in depth and 1,000 feet in length, and the Gammon 62 feet in depth and 200 feet in length. These notes are not detailed and make no claim to great accuracy.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1887	2,305	12	13	1,094	2	2	3
1888	2,709	4	8	1,292	2	3	8
1889	2,440	15	18	1,639	1	9	18
1890	840	3	1	960		17	2
1891	813	12	2	803	1	0	6
1893 (9 months ending Sept. 30)	448	11	0	649		13	19
1894 (year ending Sept. 30)	336	8	0	555		12	3
	9,984	6	18	6,992			

WINE HARBOUR[1]

Location

Wine Harbour gold district is situated in Guysborough county, on a harbour of the same name, so-called because a vessel once wrecked on the sand that almost closes its entrance was laden with wine. It is about 12 miles southeast of Sherbrooke and 47 miles by post-road from Antigonish, and, although on the Atlantic coast, it is 7 miles from the nearest steamboat landing at Sonora. Coal, however, can be landed in the district by schooner.

Geology

The Goldenville formation is here folded into two anticlines converging towards the west. On account of the heavy drift the exact location of the north anticline and the syncline has not been as accurately determined as could be desired.

The northern anticline[2] passes through area 388, block 6, immediately south of Rocky point on Indian harbour, where the strata dip at low angles increasing to 75 degrees north at Fleming cliff, and to 45 degrees south. This anticline runs north 74 degrees west and merges into the southern fold several hundred feet north of the Major Norton workings.

The southern anticline crosses the south end of Barachois pond, runs north 65 degrees west under the boulder clay of Rude hill, passes 100 feet south of the old site of the Eureka mill, follows Barachois brook, and outcrops at the surface on area 36, block 41, at a distance of 750 feet north of the Major Norton workings, beyond which it runs beneath drift north 63 degrees west, passing a short distance north of the Smelt Brook cove of Wine harbour and past the south end of lake Cooper, where it is well exposed. The fold plunges east and west at low angles and the centre of the dome lies in the west end of the district, although on account of the drift it has not been located. The strata of the north limb dip north 50 degrees to 60 degrees, whereas on the south limb the dip increases abruptly to 70 degrees, then gradually to 80 degrees.

---

[1] Plan published.

[2] Faribault, E. R.: Geol. Surv., Canada, v XV, pt. A, p. 415.

The intervening syncline runs west from the north end of Barachois pond, passes 150 feet north of the old site of the Eureka mill, and is exposed pitching east at a low angle on area 140, block 6.

The south anticline may be considered the main anticline of the district, and the north fold as a subordinate crumple on its north limb.

The eastern part of the district has suffered little from faulting, but in the southwestern part a series of faults radiates towards the south and southeast crossing the Major Norton, Creighton, Hog, Halliday, Desbarres, Washington, Air-shaft, Plough, and Caledonia leads and increasing the expense and difficulty of recovering the ore from this zone of enrichment. The largest of these has been shown by Mr. McGrath's development work on the Plough lead to have at this point a horizontal displacement of 130 feet to the north and a downthrow of 57 feet on the east side.

Character of the Deposits

The veins are of the interbedded class. A few were observed along the shore of Indian harbour, 800 feet north of Rocky point, but none has been developed, and on area 140, block 6, a belt of promising but undeveloped quartz rolls in slate was uncovered in the synclinal trough; with these exceptions all the veins of this district occur on the south limb of the south anticline.

There are three well-defined sections in this district in which active mining operations have been conducted, separated by sections that have as yet proved unproductive. Further explorations may nevertheless prove these auriferous, and they with the developed parts of the district may make one long, continuous pay zone receding from the anticlinal axis as it extends towards the southwest.

At the Barachois mine, at the eastern end of the district, a zone of auriferous veins lies between 200 and 300 feet south of the anticline, and pay-shoots dipping east have been profitably worked on the Romkey, Twin, and Hamilton leads. The pay-shoots on the Romkey were worked 100 feet in length and 200 feet in depth.

To the west of this mine lies an undeveloped section and at a distance of 2,500 feet west and 500 feet south of the anticline is another productive section in which the Charlotte and Eureka leads have been worked, the latter for a length of 500 feet and a depth of 210 feet.

West of the Eureka mine succeeds 2,250 feet of drift-covered and undeveloped ground, succeeded by a wide zone of productive veins with pay-shoots dipping east, including the Hattie-Mitchell, Desbarres, Plough, and Caledonia. On the Hattie-Mitchell lying 1,000 feet south of the anticline a rich pay-shoot dipping east was worked 800 feet in length and 240 feet in depth, and 150 feet farther south the Desbarres or Middle lead was worked 800 feet in length and 80 feet in depth. On the Plough lead belt a pay-shoot of quartz 18 feet wide and dipping east 16 degrees was worked across three properties for a length of 1,200 feet and a maximum depth of 405 feet. On the Caledonia a very rich and regular pay-shoot dipping east 26 degrees has been worked for a length of 500 feet and a depth of 175 feet to a small fault, beyond which it has not yet been found. The Wiscassett and Washington belts have been worked respectively 375 and 250 feet in length and 65 and 75 feet in depth. The Moore lead has also proved rich and has been worked 400 feet in length and 190 feet in depth. It is cut at the western end of the works by a left-hand fault running northeast. Several very large belts of low-grade ore have been developed to the south of the Moore lead.

The pay-shoot of the Plough lead belt is formed by numerous quartz angulars dipping south into the belt. These angulars appear to extend to the southeast and northwest across the formation and constitute a zone of special enrichment on the Moore, Caledonia, Plough, Wiscassett, Washington, McKenzie, Gillis, and Mundic leads. The Plough lead belt was so named, it is said, because the first evidence of gold at this point was detected in a furrow by a man who was ploughing here. Its hanging-wall is smooth and clearly defined throughout all the workings, and is closely followed by a small but persistent vein called the Little South lead, varying from ½ inch in thickness, and enriched at its intersection with the angulars from the north.

History

Regarding the discovery of gold at Wine Harbour, the Chief Gold Commissioner says: "Gold was first discovered in this district by Joseph Smith, in the latter part of July, 1860, at or near the Barachois, on the southwest side of Indian Harbour, at the point where the Barachois lead touches the shore, at which place he found a few small specks of gold in the sand. In the latter part of the month of July in the following year, while prospecting on the northeastern shore of Wine harbour, he found a small piece of gold-bearing quartz in front of what was allotted to him as his free claim which lead to the discovery of the Smith lead." This is probably the one indicated on the plan as the Caledonia. Quite a little alluvial gold was recovered in the early days, but it was insignificant in comparison with the amount recovered by lode mining.

After the discovery of auriferous quartz in 1861, prospectors flocked to the district and there were two hundred men at work on September 26, when the Government took formal possession and placed a deputy surveyor in charge. In 1862, seven leads had proved auriferous, the Smith, Middle, Major Norton, Barachois, Halliday, Wiscassett, and Gillespie leads. The Smith lead had yielded the largest quantity of gold, the richest quartz being taken out at a depth of 30 feet, where its average yield was 6 ounces per ton; while on the Hattie claim, 5 tons yielded 125 ounces. At a depth of 50 feet the ore averaged about 3 ounces per ton. The Middle lead was considered second in quality and at a depth of 48 feet, which was the depth of the deepest shaft, the ore averaged 2½ ounces per ton. The Major Norton was not found very auriferous; the Barachois had not been thoroughly tested; only two of the four veins in the Halliday lead had been found auriferous, although only two pits had been sunk 15 feet; the Wiscassett had been found to carry 1½ ounces at the bottom of a 30-foot shaft and no sinking had been done on the Gillespie lead. This is probably the lead indicated on the plan as the Moore lead.

Although mining was hampered to a certain extent by the small size of many of the areas, as at Tangier and the Ovens, it became a settled industry in 1863, and operations were so brisk that this district had the distinction of having produced this year a larger amount of gold than any other district in the province, and the average amount produced per man was second only to that of Sherbrooke. The result of mining operations in 1864 continued to be highly satisfactory, the yield per man being considerably higher than in any other district and the total production for the year being much higher than for any other year in the history of the district. The next three years, however, saw a steady decline and the production fell from over 4,000 ounces in 1864 to 845 ounces in 1867.

In 1866 the principal mining operations were carried on by the Caledonia, the Glenelg, and the Eldorado Companies, and by the Honourable the Attorney General, the Hattie lode being the one most extensively worked. This is now known as the Caledonia lead. Shafts varying from 70 to 183 feet were sunk on it. The areas of the Caledonia and the Glenelg Companies lay adjacent to each other and hoisting and pumping were done at both mines by the engine at the former company's main shaft. At a depth of 80 feet and at a distance of 70 feet from the 183-foot shaft on the Caledonia areas a crosscut was driven north 50 feet and south 38 feet, but no veins of any value were cut. To the east and on the Hattie lead three shafts were sunk by the Honourable the Attorney General. The Eldorado Company this year started a tunnel from the shore northward to cut the Middle lode which lies some 700 feet north of the Hattie lead, the object being to explore the intervening ground and to provide a means of drainage. Operations were also begun this year at the Barachois and four 40-foot shafts were sunk on a lode 10 to 12 inches thick.

Mining was dull during a part of 1867, but a change in the ownership of some of the properties led to a renewal of activity. Shafts were deepened on the properties formerly owned by the Caledonia and Glenelg Companies, and the Eldorado Company extended its tunnel to a length of 300 feet. At the Barachois, the Orient Company continued two shafts on the Romkey lode to a depth of 90 and 100 feet; 50 feet north a shaft was sunk on another lode, and to the west Messrs. Capel and Pearse sank two shafts on the Romkey lode.

The principal operators during 1868 were the Orient, the Eureka, the Eldorado, and the Provincial Companies. The Orient Company did no very extensive work and suspended operations late in the year. The Eureka Company sank a 30-foot shaft on the McDonald lead, but operations were almost wholly confined to the Eureka lead on which two shafts were sunk 50 and 100 feet and a crosscut was started to the south. The Provincial Company did some work on the old Caledonia and Glenelg properties, and sank a shaft about 200 yards to the west of the Caledonia shafts on a lead thought to be about 18 feet north of the Hattie lead. At a depth of 30 feet an exploratory crosscut was started northward. The Eldorado Company in addition to extending the tunnel to a length of 440 feet sank a shaft 150 yards west of the tunnel on what was thought to be the Hattie lead. In addition to the above-mentioned work Mr. McIntosh directed his attention to sinking on a lode some distance to the west of all these older workings.

In 1869, on the Napier Company's property, which consisted of the old Provincial areas and some adjoining areas, three shafts were sunk, and some crosscutting and development work was done, and the Eureka Company did considerable stoping and some crosscutting. In the crosscut to the south a 5-inch lead was cut and levels were driven on it. On the lode opened by Mr. McIntosh, the Globe Company worked a belt 11 feet wide by an open-cut 420 feet long. Another belt, 16 feet wide was also worked by open-cut. Both of these belts were also opened by shafts sunk by the Eldorado Company. This company completed its tunnel and through a 74-foot shaft hoisted ore from the lode cut by the tunnel. Nothing was done this year by the Orient Company.

The year 1870 saw a marked decrease in the amount of work done, but a slight increase in production. The only mines in operation were those of the Eldorado and Globe Companies and both of these companies continued to mine the belt of lodes opened by Mr. McIntosh. A width of from 6 to 8 feet was stoped out. At the end of the year work was resumed on the Eureka property on the lode opened by the south crosscut and carried on during 1871 by the Phoenix Company, who reported 151 ounces of gold from 140 tons of ore. Small returns were made in 1871 by the Provincial mine and the Gladstone Company, but 1,267 ounces out of the 1,438 ounces produced by the district were returned by the Eldorado Company who crushed 1,786 tons taken from the belt of lodes, worked the preceding year. On this a new shaft was sunk.

After doing development work on the Eureka and Charlotte lodes the Phoenix Company suspended operations early in 1872. Work was, however, vigorously carried on by the 'English Company'—Mr. Sprague, manager—on the Eldorado property, with very gratifying results. The Plough lead was mined and ore was hoisted through a 110-foot shaft from a stope carried down 13 feet wide and 100 feet long. Work was also resumed on the old Eldorado tunnel with the intention of draining the leads that lie within 560 feet of the Desbarres lead. This tunnel was continued as far as the Mitchell lead in 1873. The Plough lead gave very satisfactory returns during the greater part of the year, but it was found to be faulted at the east and as it could not be picked up again the Eldorado Company extended the shaft in depth. Some work was done on the Norton and Hattie leads, and Mr. McIntosh opened the western extension of the Plough lead, but found that it was not rich enough to be profitably worked. This year the main lead at the Barachois was reopened and worked.

In 1874, the Eldorado Company suspended operations, for on sinking 20 feet below the 130-foot level the lead pinched to less than 2 inches and carried no gold, and at the east it was cut off by a fault, and pinched and became barren towards the west. At the Barachois the thick lead was abandoned and some work was done on a lead 25 feet to the south. A little work was also done on the Major Norton.

After this followed a long period during which little mining was done except by tributers, and for over 20 years the production was very low, there being many years in which little or no gold was reported.

In 1875, work was suspended at the Barachois and about the only mining done was on the Plough lead, where tributers removed the roof of the belt and the parts that had been left to support the walls, and on the Mitchell lead, where blocks of the vein left between adjoining claims were removed. The production of 1876 rose to over 1,200 ounces, but most of this came from branches and spurs of the Plough lead. Some tributing was done on Judge Henry's property on the Moore lead, areas 15 and 27, block D, and on the Middle and Mitchell leads. Work was continued on the Moore and Mitchell leads in 1877 and some mining was done at the Barachois.

The history of this district can be little more than a record of the leads worked during the different years, as no mining of any great extent was undertaken for two decades. In 1878, the Plough lead was partly pumped out, there was some tributing, and a little work was done on the Mitchell lead. The next year work continued on the latter lode and several crushings were then taken from the Hattie lode and the Wiscassett belt. In 1880, Mr. W. May removed a little ore from the Plough lead and prospecting was carried on, bot only 61 ounces of gold was returned. Work was started on the Henry mine and this was practically the only one worked during the following year, when 795 ounces were recovered. Operations at this mine were, however, suspended in the spring of 1882, and for a few years the district was idle. In 1885, Mr. Colchester worked a lead that yielded 15 pennyweights per ton. In 1887, the mill on the Judge Henry property was taken down and rebuilt on a new site preparatory to reopening the mines the next year, and in 1888 mining was carried on to a limited extent by the Napier Mining Company, who returned a yield of 239 ounces from 324 tons. During 1888 some time was spent also in searching for the eastern extension of the Plough lead. In 1889, the Napier Mining Company continued working on a small scale, but the principal operations were on the Middle lead where the ore was crushed at a new mill erected to replace the old Eldorado mill. In 1890 the Napier Mining Company recovered 73 ounces from 278 tons, and the New Eldorado, 590 ounces from 1,445 tons. In August, 1891, R. McNaughton worked the Middle lead leased from Mr. Harding and associates, and started work on the Caledonia, but operations were suspended later in the year. In 1892, little gold was recovered, but there were sixteen men at work in September under the management of H. Harding. Returns were made by McNaughton in 1893.

Although no returns were made in 1894, the Eureka lead was reopened by the Eureka Gold Mining Company under the management of A. McQuarrie; it was, however, allowed to fill again in the autumn. There was also a little prospecting in the district. The Wine Harbour Gold Mining Company was incorporated this year and the following year a search was made for the eastern part of the Plough lead. Under the management of George Stuart the extent of the displacement was determined and a shaft started east of the fault to cut the Plough lead. In 1895, the Barachois Gold Mining Company, under the management of M. McGrath, did some work on the Romkey and Twin leads, and continued operations for two or three years. In 1896, twenty-three men were employed under the management of Richard Sherman, and ore from the Romkey lead was crushed at the 10-stamp mill. The next year Martin O'Shaughnessy was manager and work was continued on the Romkey lead, although preparations were made to reopen the Twin lead. In 1897 the Napier Gold Mining Company also did a little work under the management of H. T. Harding, and crushed considerable ore in 1898.

In 1899, the production of the district was greatly increased, being over 1,500 ounces, of which the greater proportion was recovered by the Guysborough Gold Mining Company, Limited. Some work was done by the Napier Gold Mining Company, under the management of David Steele. Operations were also carried on at the Wiscassett mine and on the Plough lead by the Plough Lead Gold Mining Company—Mr. McGrath, manager. The shaft was 110 feet deep and levels were driven east and west 60 and 70 feet respectively. The most extensive operations were those of the Guysborough Gold Mining Company, Limited, on the old Eureka property. Forty men were employed under the management of E. A. Mortimer; an air compressor, a modern 10-stamp mill, and a Wilfley concentrator had been erected and ore was hoisted by three shafts, two of which had been sunk some years previously. A cyanide plant was erected in this district on Coopers brook by Messrs. Wethersole and Russel for the treatment of tailings.

The work at the Eureka mine ceased in March, 1900, and the mine remained idle until June, when it was taken over by the owners of the Plough Lead mine and operated. The Plough Lead Mining Company extended the shaft on the Plough lead to a depth of 177 feet and stoped from the 20-foot belt, of which 75 per cent was milled with the result that by far the largest returns of the district for this year were made by this company. In sinking the shaft the old fault was encountered and it was determined to sink a new shaft 175 feet farther east.

In October, 1899, McNaughton's shaft at the old Middle Lead mine was reopened by M. L. Pratt and Company, under the management of R. S. Irwin, and in 1900, a considerable amount of low-grade ore was crushed at a new 5-stamp mill. In 1901 this company continued operations at three different points on the old Provincial property under the management of Mr. Conroy. A shaft 13 feet by 4 feet inside timber was started 600 or 700 feet east of the Plough Lead works with a view to tapping the ore-body of the Plough lead at a depth of over 200 feet. Old workings on the Caledonia belt were reopened and some levels and a crosscut were driven. In addition to this a shaft was sunk 50 feet deep at a point north of the road and near the schoolhouse and crosscuts were driven to the Hattie and Mitchell leads. This year the Plough Lead Mining Company—J. S. Lowe, general manager—had thirty-five men employed and stoping was carried eastward on the pay-shoot, which dipped 18 degrees. The new shaft to the east was started and sunk to a depth of 90 feet. The Eureka lead, half a mile to the east, was also opened by a new shaft.

The principal production of 1902 was made by the Plough Lead Mining Company, M. McGrath, manager. The new shaft at the east was connected with the underground workings from the west and stoping was active, the ore being crushed at a 15-stamp mill. Work was also carried on by a company incorporated this year, the Old Provincial Mining Company—M. L. Pratt, president, S. R. Heakes, general manager. E. Conroy had charge of the work near the Plough lead and George Hirschfield of the Caledonia mine. At the former the shaft was continued to a depth of 300 feet, and some levels and crosscuts were driven; at the latter some levels were driven. Work was resumed on the old Napier property by R. S. Irving for L. W. Getchell and T. R. Gue. An old shaft on the Moore lead was cleaned out, and at a depth of 175 feet a crosscut was started to the south. The Napier mill of 13 stamps and the old plant were in use.

In 1903, the Plough Lead Mining Company followed the ore 86 feet east of the east shaft, removing it by underhand stoping. The Old Provincial Mining Company deepened the shaft sunk for the Plough lead to 350 feet and did some crosscutting. At the bottom a crosscut driven to the south 21 feet struck what was thought to be a continuation of the Plough lead and levels were driven on it east and west. Work was also continued at the Caledonia mine and the ore was passed through a 15-stamp mill and a Wilfley concentrator. The old Napier property was worked under the direction of L. W. Getchell and produced about 230 ounces.

In 1904, stoping was continued by the Plough Lead Mining Company, but this was the last year in which returns were made. The Old Provincial Mining Company suspended operations at the Caledonia mine, but continued work at the Plough Lead shaft. This shaft was deepened to about 400 feet, crosscuts and levels were driven, and some ore stoped out. The Napier mine was kept unwatered and a little work was done.

In 1905, the Old Provincial Mining Company—S. R. Heakes, manager—was the only one to make returns. The Little South lead, which formed the hanging-wall of the belt known as the Plough lead, was driven on 95 feet east and 107 feet west on the 400-foot level. The mine was closed in August, 1905, and remained closed until the following March, when it was reopened by the Wine Harbour Mining Company. Forty men were employed in 1906 and ore was removed from the 300 and 350-foot levels west and the 400-foot level east. The same company was at work here in 1907 under the management of J. Owen James, and work was almost wholly confined to the 300 and 350-foot levels west, 6,333 tons mined and crushed yielding 1,017 ounces. Mining operations were discontinued in September.

General Development

A fair idea of the extent to which operations were carried on here can be had from the published plan for which the survey was made in 1902, from the notes on the pay-shoots given under the section dealing with the ore deposits, and incidentally from notes on the history of the district. The exact degree of development in individual mines is, however, difficult to learn.

Regarding future explorations the attention of the prospector might be called to several undeveloped veins lying to the north and south of the Twin, Romkey, and Hamilton leads. Then, too, the unproductive sections already pointed out as lying between the three productive portions of the district should claim some attention. Rich drift has been found immediately to the north of the Moore lead, and between the Eureka and the Barachois properties. As the direction of glaciation was here south 9 degrees east, it is more than likely that the extraordinarily rich drift found along the shore at Doody head came from the latter portion of the district.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1862	1,688	0	0	880	2	0	10
1863	3,718	2	19	3,644	1	0	10
1864	3,120	9	5	2,738	1	2	19
1865	2,664	3	11	4,363		12	5
1866	1,224	13	1	2,192		11	4
1867	764	9	9	1,667		9	4
1868	1,566	6	16	3,303		9	12
1869	719	8	19	2,726		5	6
1870	914	15	14	2,356		7	17
1871	1,538	6	16	2,927		10	4
1872	2,572	10	18	2,309	1	2	7
1873	2,000	0	3	2,267		17	15
1874	633	11	6	1,193		10	15
1875	492	11	22	1,140		8	15
1876	1,217	19	7	1,929		12	15
1877	580	14	3	1,068		10	21
1878	492	13	12	814		12	2
1879	427	5	6	424	1	0	0
1880	61	12	0	161		7	10
1881	795	14	0	552	1	8	20
1882	91	9	0	145		12	13
1888	239	2	0	324		14	18
1889	413	18	6	707		11	17
1891	698	9	0	1,823		7	15
1896	501	2	6	913		10	2
1897	318	3	2	611		10	9
1898	113	5	17	637		3	13
1899	1,529	17	0	2,031		15	1
1900	2,088	17	0	3,691		11	7
1901	1,362	4	12	4,196		6	12
1902	1,186	2	0	4,187		5	16
1903	1,412	8	11	4,048		6	23
1904	1,681	3	10	5,133		6	13
1905	452	10	0	2,251		4	0
1906	413	2	0	858		9	16
1907	1,017	17	0	6,333		3	5
	40,712	18	11	76,544			

Prospects

In addition to the above there are a great many other places from which gold discoveries have been reported, and at some points more or less development work has been carried on. There has been a great deal of prospecting throughout the gold fields, especially along the anticlines, and numerous veins have been exposed; for example, along the Tangier-Harrigan Cove anticline veins have been exposed at Quoddy, Port Dufferin, Sheet Harbour, Mushaboom, Taylor bay, and at different places west of Tangier.

The following list is by no means complete, but it gives the names of the most important places at which prospecting has been carried on:

Barr Settlement in Hants County.

Beaver Bank Road. Auriferous drift has been found along the Shubenacadie-Grand Lake anticline between Sleepy cove and Beaver Bank road and some prospecting has been done on Officer brook and between Golden lake and Sandy lake.

Birch Cove and Prince Lodge. At Birch cove the Goldenville formation is folded in an anticline plunging southwest at an angle of 25 degrees. A discovery was reported from here in 1868 and prospecting has been carried on at different times. It was reported in 1889 that a 12-inch vein was found that showed gold throughout a length of 100 feet. Some auriferous quartz veins have been prospected also at Prince Lodge a little north of Birch cove.

Black River, Kings County. A discovery was reported in 1868, and a very little prospecting has been done.

Broad River, 10 or 12 miles west of Liverpool in Queens county; discovery reported in 1888.

Cameron Dam and Seventeenmile Stream, in the western part of Guysborough county. The Cariboo-Cochrane Hill anticline here plunges eastward. Several large veins have been exposed near Cameron dam at the foot of Lower Rocky lake, an expansion of Twentymile stream, East River Sheet harbour, and between Round lake and Seventeenmile stream.

Centry. [1]"At Centry, often wrongly called Centre, several large blocks of quartz sprinkled with gold have been found the last few years between Dares lake and the main road leading from Lunenburg to Bridgewater, 3 miles out from the former town, and much prospecting has been done to find the vein in situ, but until now without success. There is very little doubt that this float comes from the anticline passing immediately north of Dares lake, where the quartzites of the lower division have been brought up on a broad elliptical dome, 3 miles long by 1 mile wide.. ..Much prospecting was done by Walter H. Prest to the north of the float, on the south limb of the quartzite dome, and several interbedded veins were discovered, but no gold was found in the veins or drift, showing that the gold-bearing vein is farther south."

Chegoggin. At a point on the shore 4 miles north of Yarmouth a bed of quartzite 350 feet thick is found in a series of schists. A 10-stamp mill was erected here in 1890 and some of this quartzite was crushed.

Chezzetcook. Some quartz veins have been prospected from time to time on the Lawrencetown anticline at Head of Chezzetcook not far from the post-road. About 2 miles southwest of here, near Porters lake, a few other quartz veins received some attention.

Clearland. Near Clearland post office in the eastern part of Lunenburg county a few quartz veins on the Leipsigate-Gold River anticline have received a little attention and a 22-foot pit was sunk on one that is 2 to 12 inches thick. There has been prospecting along this anticline from the foot of Long lake on Mushamush river to West lake on Martin river.

Cole Harbour. A few veins were opened at the head of Cole harbour on the western continuation of the Lawrencetown anticline.

Copes Dam. Some prospecting has been done at Copes dam and at Rocky lake on the Moose River-Fifteenmile Stream anticline on each side of the Sheet Harbour road.

Fairview or French Landing. A cross vein has been prospected about half a mile west of Bedford basin, between Fairview and Rockingham.

Farmville on the New Cornwall road in the eastern part of Lunenburg county. There are a few veins in the slate and a pit has been sunk 40 feet on one.

---

[1] Geol. Surv., Canada, Sum. Rept. 1907, p. 80.

Gegogan. There is a dome on the Mooseland-Gegogan anticline, between the mouth of St. Mary river and Gegogan harbour. Rich drift has been found on both sides of Gegogan harbour, but prospecting has not resulted in the discovery of any important veins, and it is believed that the best veins lie in the harbour.

Greenfield in Queens county, discovery reported in 1888.

Halifax City. The Halifax formation is exposed on the western continuation of the Lawrencetown anticline. Most of the prospecting has been done between Quinpool and Jubilee roads. One trench cut twelve quartz veins varying in width from 1 to 12 inches and some of them were found to be auriferous. Among the veins that have received some attention are: a 3-inch vein near the corner of Oxford street and Quinpool road; a vein between Pepperel and Shirley streets just east of Preston street; a 2-inch vein on Louisburg street between Shirley and Linden streets. In a syncline north of the Lawrencetown anticline a vein carrying gold, galena, and zinc blende was found between Lockman and upper Water streets and south of North street.

Hammond Plains. This was surveyed in 1863, and in 1868 it was reported as abandoned, not having come up to expectations. It is reported that three veins were opened on the north side of the main road 2½ miles west of English Corner and three shafts were sunk 130, 30, and 15 feet. The veins are 48, 8, and 7 inches wide, lie near the bottom of the Halifax formation, cut the strata at a slight angle, and dip south 75 degrees. Two veins also near the bottom of the Halifax formation and lying 2 miles east of Hammond Plains post office were tested by shallow pits.

Horne Settlement, 2 miles west of Enfield station. Four or five interbedded auriferous leads have been prospected. They show the corrugated structure, lie in the Goldenville formation on the north limb of the Shubenacadie-Grand Lake anticline, and dip north at high angles.

Indian Lake or Fifteenmile Lake on East River Sheet harbour, east of Governors lake. There has been some rich drift found here on the South Branch Musquodoboit anticline, and some prospecting 2 miles farther east on Bottle brook.

Indian Lake on the headwaters of Indian river of St. Margaret bay; a little prospecting.

Kearney Lake, west of Bedford basin. The Goldenville formation is exposed in a transverse anticline running north 28 degrees west (magnetic) through the middle of Kearney lake. The strata dip at low angles forming a broad dome. Several corrugated interbedded veins have been discovered near the foot of the lake.

Lewis Lake. Several veins showing the corrugated structure and dipping south at a high angle have been found just south of Lewis lake on the Halifax and Windsor road.

Little Liscomb Lake, in the northwestern part of Guysborough county. A few auriferous veins apparently on an anticline have been prospected, and a crusher was erected.

Liscomb Mills, at the head of Liscomb harbour in Guysborough county. The Goldenville formation is exposed on the Salmon River anticline plunging to the west. The veins are interbedded and the following have been noted: [1]'Giant Reef,' a quartz vein 20 feet wide; a 20-foot belt of slate and quartz showing gold; a 15-foot quartz vein; and a 10-foot belt of slate and quartz. All these dip north 42 degrees and are traceable three-fourths of a mile. There has been prospecting from Liscomb river as far west as Spider lake. A light 5-stamp mill was erected at the saw-mill and a little ore was crushed.

Lindsay Lake. A few interbedded veins have been prospected near Lindsay lake a short distance east of Middle Musquodoboit. Sydney Lindsay erected a 5-stamp mill late in the eighties and tested some leads, and again in 1903, another test was made of one of the leads. A pit was sunk 20 feet on a barrel-quartz vein.

Meagher Grant. Some prospecting has been done along the Moose River anticline east of Meagher Grant on Musquodoboit river. Several veins showing corrugations have been discovered and some are auriferous.

Meteghan in Digby county.

---

[1] Rept. Dept. of Mines, N.S.. 1898, p. 35.

O'Brien Lake, 4 or 5 miles south of Oldham. An auriferous vein was found on the west side of the lake.

Porter Lake. Some veins have been found on Porter Lake anticline, on the east side of Porter lake and about a mile north of the post-road. A discovery was reported in 1880, and prospecting has been carried on at different times since then. Some veins have been traced around the apex of the anticline and several varying from 1 to 13 inches in width have been exposed in slate belts in the Goldenville formation on the south limb of the fold. Some of these are auriferous. Some veins have been prospected about a mile east of here on the south side of Thompson and Conrod lakes.

Pubnico in the southwestern part of Yarmouth county. A discovery was reported in 1868, some work was done in 1885, and a test of five tons is said to have given 64 ounces.

Queensport, formerly known as Crow harbour, in Guysborough county. It is reported that an auriferous vein 2½ to 3 inches thick was discovered in 1898 and some prospecting was done south of Round lake.

Quoddy. A test of some quartz was made in 1906.

Ragged Falls, on Twelvemile stream, a branch of East river, Sheet harbour. A number of interbedded veins have been prospected on the south limb of the Moose River-Beaver Dam anticline. The Goldenville formation is exposed and the south limb dips north 80 degrees. A number of veins have been opened in recent years.

Rhodes Corner, west of Centry, Lunenburg county. Some veins have been prospected on the western plunge of the dome.

Rutherfords Mill, on the Guysborough road, 2 miles northeast of Fall river. Several veins have been prospected in the Goldenville formation.

Sheet Harbour, East river and West river. Several veins have been prospected at the mouths of these rivers on the south limb of a subordinate fold on the south limb of the Salmon River anticline. At East river shafts have been sunk on a vein above the bridge. At West river several veins have been tested at the falls above the bridge. Rich drift found on Curry hill has led to much prospecting, but the source has apparently not been found. In tracing drift in this locality account must be taken of the left-hand fault along the harbour with a displacement along the strike of about a mile.

Somerset, 3 miles south of Italy Cross, a station on the Canadian National railway. Some auriferous boulders from a laminated quartz vein 10 inches thick were found in 1905 by Nathaniel Slaughenwhite on the north side of the west branch of Petite rivière. Some prospecting was done in 1906 and 1907, but without success. The Goldenville formation is exposed in a broad anticline plunging east, and interbedded veins would strike north and south. Auriferous boulders were discovered a mile west by Augustus Reinhardt.

Spondo, in Lunenburg county, 7 miles north of Mahone bay and a mile west of the Woodstock road. A quartz vein 10 feet thick lies on the apex of an anticline plunging to the east at a low angle. It was discovered in the early days of gold mining in Nova Scotia, but little has been done. There is a hole 15 feet deep. A trench cuts a few other veins.

Stewart Brook, near Country harbour.

Stillwater. In 1922 a 74-foot shaft was sunk on altered sediments on St. Mary river 7 miles from Sherbrooke and a tunnel was driven in from the bank of the river 270 feet. The rock carries pyrite and the company claimed to have some secret process for the recovery of gold.

Tancock Island. A little work was reported in 1881. The Goldenville formation is exposed in an anticline running along the north shore of Southeast cove and forming a dome at Reef point. A few shallow pits have been sunk on the north shore of the cove on veins 3 to 16 inches thick. These veins cross the strata at right angles, dip east 50 degrees to 60 degrees, and appear to pinch out at no great depth.

Upper New Cornwall, in Lunenburg county. Some prospecting was done in 1899 and 1900 on Rocky point on the north shore of Big Mushamush lake.

Waterville, Kings county. Quite a little prospecting was done at one time a few miles south of Waterville station.

West Caledonia, 6 miles west of Caledonia, on the Caledonia branch of the Canadian National railway. A discovery was reported in 1888 and there has been quite a little prospecting since. Some rich drift was found and four or five auriferous leads were cut. W. H. Prest did some prospecting here in 1908 and 1909.

Wyses Corner. A little southeast of Wyses corner, a 30-foot shaft was sunk on a 6-inch vein near the contact of the Halifax and Goldenville formations on Dollar Lake brook. Another vein was found 1½ miles west of Wyses Corner.

York Redoubt. A few quartz veins were prospected on Sleepy cove of Halifax harbour at the contact of the slate and granite.

Outside the Gold Fields. There has been some prospecting at different times on the mainland outside the gold fields. Gold[1] was reported many years ago from cape Porcupine in Antigonish and from Clam Harbour river, about the Middletown road. and some quartz was sent away to be tested, but the results were probably not good. Gold was reported from Sutherland river in 1868. In 1895, there was some prospecting on this river near Greenvale in Pictou county. The rocks consist of slates and quartzites indicated on the map as of Cambro-Silurian age. One quartz vein carrying sulphides was found over 2 feet thick. Gold[2] is said to have been discovered in a quartz vein on Robert Wilson's property, French river, Colchester county, by some men digging a well. The rocks of this locality are talcose micaceous schists and are cut by irregular quartz veins. "Near William Warwick's at West Annan one of the irregular deposits of sulphides of iron, copper, and other metals, said to carry gold, exploited from time to time in the Cobequid hills, was developed to some extent" [3]in 1903, and in 1904 the Gilt Edge Gold Mining Company erected some buildings. On Bailey brook[4] south of West River station there has been some prospecting and a shaft was sunk 30 feet in blackish Devonian argillite cut by a band 3 feet thick of clay rock resembling felsite containing graphite, calcite, and pyrite. Some prospecting was also carried on many years ago in Colchester county near where the Florida road crosses the line between Colchester and Cumberland. Other places where there has been some prospecting are McLellan brook, Riversdale, Folly mountain, Tatamagouche mountain, and Irvin lake.

---

[1] Fletcher, H.: Geol. Surv., Canada, Rept. of Prog. 1879-80, pt. F, p .123.

[2] Geol. Surv., Canada, Ann. Rept., vol. I, pt. A, p. 18.

[3] Geol. Surv., Canada, Ann. Rept., vol. XV, pt. AA, p. 171 .

[4] Geol. Surv., Canada, Ann. Rept., vol. V, pt. P, p. 187.

CHAPTER V

SECONDARY GOLD DEPOSITS

PLACERS

The Gold-bearing series has been subjected to long-continued erosion, and the upper parts of the auriferous veins now exposed have been removed. The heavy metals were, no doubt, concentrated by the selective action of water currents, and in the valleys of some of the rivers that include within their basins one or more gold districts placers were found. Unfortunately the province has been subjected to glaciation, and there has been considerable redistribution of the loose surface material.

Detrital gold deposits may be divided into two classes: (1) ancient and (2) modern. The latter consist of those that have been formed within comparatively recent times and are unconsolidated, whereas the former are of Tertiary or earlier deposition, and are more or less consolidated. The two classes have been worked in Nova Scotia, the ancient at Gays river, and the modern at the Ovens, and at a few other places.

MODERN PLACERS

Alluvial gold in modern placers has been found in one or two places, and [1]in nearly all deposits of glacial drift, or boulder clay, on the south coast, more or less gold is found.

Placer mining, however, has never assumed important proportions. How, in his Mineralogy of Nova Scotia, 1868, says he was informed that gold had been washed from Avon river near Windsor 60 years previously, each man earning 18 pence per day. One of the first to carry on careful investigations was John Campbell of Dartmouth. In the year 1849 he panned gold from several places along the seashore and

> [2]"continued his investigations with varied success until 1857, when he obtained the co-operation of Mr. R. G. Fraser, the assayer, who made some experiments on the sands of Fort Lawrence, in Halifax harbour, from which they obtained a very good show of gold.
>
> Encouraged by these results, Mr. Campbell made a report to the Government, accompanied by specimens and testimonials from persons who had seen other specimens which he had retained, stating his belief that gold would be found in large quantities. He also made application for a licence to prospect and mine on Sable island, where, judging from samples still in his and Mr. Fraser's possession, the sand is highly auriferous. No action was taken upon that report, and though the prospecting licence was accorded its terms were so liberal that Mr. Campbell and his friends had to abandon the project, for which tools, machinery, miners, and a vessel to transport them had already been purchased."

In his report of 1863, Campbell gives the results of certain explorations in the west of Cape Breton, where he discovered gold in the alluvium of many streams, and in such quantities on the northeast branch of the Margaree and on Middle river that he expressed the opinion that washing in these streams would prove remunerative. In 1867 an American company constructed sluices near McLennan's bridge on Middle river, and worked during the summer. In 1870 others tested the brooks above McLennan's bridge by means of cradles, sluices, and pans, and in 1902 some Chinamen did some work there, but none of the operations was continued long.

---

[1] Campbell, J.: "Report on the Nova Scotia Gold Fields, p. 3, Feb. 25, 1863."

[2] Heatherington, A.: "A Practical Guide for Tourists, Miners, and Investors and all Persons Interested in the Development of the Gold Fields of Nova Scotia", 1868.

In the early days of gold mining in the province, some gold was recovered from the alluvium at Isaac Harbour,[1] Wine Harbour, Tangier Harbour, Gold River, and the Ovens.

In July, 1861, gold was discovered in the sands of the seashore at the Ovens, Lunenburg county. These were nearly exhausted by the end of 1862, and it was estimated that altogether 2,000 ounces were produced.

Near Tangier harbour alluvial gold was obtained in 1861 and 1862, and the official returns gave 150 ounces from this source. In the sixties a small lake, called Copper lake, in this district, was drained for the purpose of getting access to the alluvium. Beneath a layer of mud and vegetable matter was found, according to Prof. Silliman, a stratum of glacial drift and tough clay which, when washed, yielded small, unrounded nuggets free from trace of mechanical action. Little work was done.

Some prospecting[2] has been done on Little Meander river of Hants county. The detritus washed from the gorge it has cut in the anticline of the Gold-bearing series, and from Ardoise gold district, has been deposited in the intervale at its junction with Meander river. A dam was built on the river below the forks by Van Meter, and there was some sluicing during the summers of 1897 and 1898. In 1899 the Rood brothers did some washing on the Little Meander below the bridge. The results are not known. No gold has been found in the main Meander river above its junction with the Little Meander.

In Ninemile river east of Renfrew, a little washing has been done, as well as in Little Ninemile river, 2 miles north of Ninemile River post office. North of Wittenburg, 3 or 4 miles east of Gays River gold district, some gold was obtained from washings below the meadow, and also 3 miles farther east from the headwaters of St. Andrews river.

Some surface material has been milled in a few of the gold districts. In 1890 several lots of surface material were crushed at Central Rawdon, and in 1892 and 1893 the Oxford Gold Mining Company at lake Catcha did similar work. More attention has been given to the loose debris at Moose River than in any other district. An attempt[3] was made to wash the alluvium on an extensive scale. A race half a mile long and two flumes, each 200 feet long, were made. A sluice 300 feet long, in which the washing was done, was constructed, but it had not fall enough to clear itself and the undertaking was abandoned. A great deal of the surface detritus was crushed for several years by Mr. Touquoy, and it is stated that during 1895 this yielded 1½ to 2 ounces per ton.

---

[1] Faribault, E. R.: Geol. Surv., Canada, vol. XII, pt. A, p. 182.

[2] Hunt, T. S.: "Report on the Gold Region of Nova Scotia", Geol. Surv., Canada, 1868.

[3] Rept. Dept. of Mines, N.S., 1878.

ANCIENT PLACERS

Ancient placers of very minor importance are found at the base of the Lower Carboniferous sediments. Conglomerates at the base of the Horton series on Fall brook a quarter of a mile below Windsor reservoir were tested at one time and[1] in the summer of 1890 great excitement was caused by the reported discovery near Brookfield, far up Stewiacke river, on the north side, of gold in a whitish grey, flinty conglomerate consisting almost wholly of pebbles and grains of white quartz. These beds underlie the Carboniferous limestone. The conglomerate is said to have given good returns on milling, but careful panning of sand in the beds of streams flowing over it failed to indicate the presence of gold in appreciable quantity. Two samples assayed by Mr. Hoffmann of the Geological Survey gave no trace of gold or silver; these were taken from the vicinity of the barite mine, and from the brook 300 yards above the Glenbervie mills. Tests subsequently made on a large scale at the mill of one of the gold mines confirmed Mr. Hoffmann's assays. Most of the work done on the ancient placers was at Gays River gold district.

GAYS RIVER

Location

Gays River gold district lies on Corbett brook in the southwestern part of Colchester county, 7 miles east of Shubenacadie, a station on the Canadian National railway. From this station it is easily accessible by a good wagon road.

Geology

This district never assumed any importance as a gold producer, but it is of geological interest. This deposit is a good example of a fossil placer deposit, the gold being found in a coarse conglomerate at the very base of the Lower Carboniferous formation. This[2] conglomerate, which in some places has a thickness of 30 feet, outcrops in a valley at the base of a ridge that is composed of the slates of the Gold-bearing series and rises to about 150 feet above the level of the Carboniferous rocks. This conglomerate, more or less auriferous, has been traced some 4 miles northeast along the base of the ridge, and 2 miles southwest from the district. It is composed of the detritus of the Halifax formation in which the pebbles of slate, and quartz vary much in size and degree of attrition from the numerous well-worn pebbles, ranging from the size of a hazel nut to that of an egg, to the much larger fragments showing much less exposure to wave action. There seems to be no uniformity in the arrangement of the pebbles. The matrix is composed of a gritty mixture of quartz, slate, and whin. A shaft sunk by the Coldstream Gold Mining Company immediately north of Daniel McDonald's old works and 800 feet from the line of outcrop of the conglomerate, gave the following section of the Lower Carboniferous:

	Feet
Surface[3] drift..	20
Conglomerate containing gypsum, non-auriferous..	35
Coarse sandstone..	2
Auriferous irregular conglomerate..	8

The conglomerate dips at a low angle in a direction opposite to that of the slate.

---

[1] Fletcher, H.: Geol. Surv., Canada, vol. V, pt. A, p. 61.

[2] Honeyman, D.: Trans. N.S. Inst. Nat. Sci., vol. II, pt. I, p. 76.

[3] Faribault, E. R.: Geol. Surv., Canada, Ann. Rept., vol. V, pt. AA, p. 58

Character of the Deposits

Some gold has been found in the drift, but the greatest amount is found at the base of the conglomerate in the matrix, in very thin flakes on the surface of the pebbles or concentrated in crevices in the underlying slate. Those crevices running at right angles to the stratification and cleavage planes were found to be the most highly auriferous. They have been called "runs" and are really joints from ½-inch to 2 inches wide and extend to a depth of as much as 10 feet. The gold is coarsest and most plentiful along and near the line of outcrop of the conglomerate.

It is believed that the gold was derived from the Gold-bearing series. A series of quartz veins, many auriferous and some of great extent, is found along an anticline on the top of the ridge to the south, and it is believed that these veins have contributed the gold, which was concentrated by wave and current action on the shore of the ancient sea.

History

Discoveries[1] of gold were made here by Berry Corbett and George Gay on their adjoining farms in June, 1862. The discoveries were made on improved land and the price demanded by the owners for permission to enter upon the land and carry on prospecting and mining was almost prohibitive, and for some time retarded the exploration of the district. Several applications were made in July, 1863, for mining lots on David Corbett's farm and later in the year on Mr. Gay's farm, and such applications were received on the applicants depositing with the Chief Gold Commissioner the requisite written authority from the owner of the soil to enter upon his lands.

In 1866, prospects were a little brighter and a small crusher was erected but was not kept very busy. In 1869, considerable work of an exploratory nature was carried out and consisted chiefly of tunnels along the bed of conglomerate. Messrs. Werner and Company drove a tunnel 200 feet long, sank two shafts, and connected these by tunnel. Messrs. Hopp, Salter, and others drove tunnels on the ground west of Werner and Company's property, and still farther west, Messrs. Gay drove over 100 feet of tunnel. Dr. McLean and Company drove about 130 feet of tunnels. Work of about the same nature and extent was done by Mr. Moore, and similar work was started by D. Annand. The result of all these operations is not recorded, except that on the works of Mr. Geo. Gay, a depression was found in bedrock in which a large amount of gold was obtained.

Operations were continued on a small scale in 1870 by Messrs Gay and Dr. McLean, the latter of whom obtained 123 ounces from 647 days' labour. Although little was done the next year, the prospects were so encouraging that a new 8-stamp mill was erected. In 1872, the principal work was carried on by Mr. McDonald, who drove a 270-foot tunnel into the hillside along the base of the conglomerate, the softer part of which he removed, leaving the boulders with the waste rock. Work was started on the adjoining area in August. A great deal of rock had to be handled to get at the gold lying at the base of the conglomerate and in the crevices of the underlying slate, but work of this kind was continued by Mr. McDonald several years, presumably with profit, and in 1874 a production of 466 ounces was reported. In October, 1875, he temporarily ceased operations on area 40. Other prospecting was done in 1875, but the work was much hindered by water.

In 1876, excavations were continued on areas 4 and 26. Two runs or depressions in the slate were followed 500 feet on the dip and found to end abruptly against a face of slate. On the opposite side of the stream, Mr. Corbett followed the dip of the bedrock 80 feet. The following year a number of shallow pits were sunk to the bedrock, but no paying "runs" appear to have been found except by Mr. Dunlop on area 3 near the mill dam. He erected a 5-stamp mill and continued work in 1878, driving an inclined tunnel along the base of the conglomerate 200 feet and sending off lateral workings to the "runs." He took little of the conglomerate, and mined chiefly the top slate, the crevices of which were filled with clay and often contained pockets of gold.

Messrs. Wilson and Corbett were the chief operators in 1879. They put up a small stamp mill and did some work on the south side of the brook. In 1880, a little work was done by Mr. McDonald on areas 3 and 4, and a little work was done during the following spring.

---

[1] Heatherington, A.: "Guide to the Gold Fields of Nova Scotia", p. 68.

Since then very little actual mining has been done in this district, although attempts have been made to boom the place. In 1883, some prospecting was done by Mr. Parker, and the following year by Messrs. Pulsiver and Holdsworth. A little prospecting continued during the eighties, and in 1890 the Coldstream Mining Company began the erection of a 50-stamp mill. This was completed in 1891, and some rock was crushed under the management of R. R. McLeod. The erection of the mill created some excitement in the district, but seems to have been ill-advised. The venture was a failure, at least so far as mining was concerned, and in 1893 the mill was sold to a company to crush the conglomerate, at Memramcook, N.B.

The report of the Department of Mines, Nova Scotia, for 1900, records a second attempt to mine the conglomerate on a large scale, but this apparently met with no better results than that of 1890. In 1900, Norman Logan had sixty-five men at work for the Nova Scotia Gold Mining Company, some old workings were reopened, a 50-stamp mill was erected, and Wilfley tables and a 150 horsepower engine were put in. Thirty stamps were in operation, but the result is not recorded.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1873	352	17	23	2,984		2	8
1874	466	14	14	2,979		3	3
1875	250	18	1	2,090		2	9
1876	246	10	4	1,699		2	21
1877	251	3	15	859		5	20
1878	243	11	16	1,126		4	7
1879	41	0	1	100		8	4
1880	13	6	6	40		8	15
1881	12	14	7				
	1,878	16	15	11,877			

CHAPTER VI

GOLD DEPOSITS OF CAPE BRETON

Gold has been found in limited amount at several points on Cape Breton island in quartz veins and in placers. The rocks of the districts consist of altered sediments and intrusives of Precambrian age, but they can in no way be correlated with the Gold-bearing series of the mainland. As each district has its own peculiarities with reference to the geology and the nature of the deposits these matters will be treated in the discussion of the individual districts.

BARACHOIS RIVER

Some[1] white, translucent quartz, carrying small quantities of chalcopyrite and pyrite, and taken from a vein a short distance up Barachois river, near St. Ann bay, Victoria county, gave the following assay:

Gold..	1·517 ozs. per ton of 2,000 lbs.
Silver..	2·275 ozs. per ton of 2,000 lbs.

CHETICAMP

Location

The auriferous deposits of this district are found on L'Abime brook indicated on the map[2] as Faribault brook, a tributary of Cheticamp river in the northern part of Inverness county. It is accessible by a wagon road from Eastern Harbour.

Geology

Along the coast is a plain broken by long, low undulations extending northeast, and back of this is a grand escarpment rising into a plateau of considerable elevation and extending inland. The coastal plain is composed of rocks of the Carboniferous system; the plateau is composed of various schists, gneisses, and intrusives of Precambrian age. Along the front of the plateau lies a mass of granite, which has determined the trend of the escarpment and retarded its recession.

Between[3] this and a mass of granite lying farther inland is a belt of sericite, chlorite, and hornblende schists, the ore-bearing series of the district.

These schists are the metamorphic equivalents of a stratified series of rocks, and the planes of schistosity generally coincide with the original stratification planes. The series has suffered a complicated system of folding and faulting. The long, wave-like folds extend north-northeast and in the central part of the area they plunge south-southwest of south, whereas in the northern part they plunge north-northeast. The structure is greatly complicated by faulting and by the cross undulations and contortions developed on the limbs of the main folds.

These schists are cut by dykes of felsite and diorite, which in places appear to be genetically associated with the ore deposits.

Ore Deposits

The ores are galena, zinc blende, chalcopyrite, arsenopyrite, pyrrhotite, and niccolite. These are more or less auriferous. The schists[4] carry a small amount of gold, which is probably associated with the arsenopyrite with which the rocks are impregnated.

---

[1] Geol. Surv., Canada, Ann. Rept., vol. XI, pt. R, p. 23.
[2] Sheet No. 9 of the Nova Scotia series.
[3] Grandin: Trans. Nova Scotia Inst. Sci., vol. XI, p. 352.
[4] Woodman, J. E.: Dept. Mines, Nova Scotia, 1898, "Ore Bearing Schists", p. 20.

The sulphides lie in lenses and irregularly shaped tabular masses lying in the schistosity planes. These bodies are frequently connected with one another by thin sheets or films of the metallic minerals lying along the planes of jointing, shearing, and foliation. Sometimes bodies of ore are found that lie partly in the foliation planes and partly cut across the bedding in an irregular manner. Quartz[1] veins are found lying in the foliation planes, a few crossing the beds. They are in some cases associated with the ore deposits, but are commonly barren.

It is thought that lateral[2] secretion played no part in the concentration of these ores, but that they were brought from below and deposited in openings produced by the movement of corrugated beds upon one another or by the separation of strata along their bedding planes on account of pressure exerted parallel to the strata. There may have been a subordinate amount of metasomatic replacement.

There are five different ore deposits on L'Abime brook and its tributaries that have received attention.

Galena. This is the deposit on which most work has been done. It lies about a mile up L'Abime brook in a gorge 900 feet below the general level of the plateau. Forming[3] cliffs on both sides of the brook in a garnetiferous sericitic schist, locally known as grey schist, and overlying it and intertonguing with it is a blue, hydromica schist, locally known as the blue schist. In some places fragments of the grey are seen intercalated in the blue. The schists form a syncline with many minor transverse and longitudinal undulations. At the deposit the prevailing dip is north-northwest at 28 degrees.

The ore[4] consists of a mixture of sulphides, galena, zinc blende, arsenopyrite, chalcopyrite, niccolite, and possibly pyrrhotite. In one opening galena predominates, and silver and gold occur, and in another opening the ore is almost entirely zinc blende, the latter deposit being stratigraphically lower than the former. The ores occur in lenses in the grey schist, and in sheet-like masses along the thrust plane at the contact of the blue and grey schists. The lenses lie in the bedding planes, or occasionally break across the strata only to follow the bedding planes again. Very little ore is found in the blue schist.

There was considerable excitement in this district in 1896 and 1897, but it was not until 1898 that the Cheticamp Gold Mining Company began active operations. A road[5] was constructed to the deposit, a concentrating plant erected, a dam built half a mile up the brook, and a wooden flume 2,600 feet long and an iron one 29 inches in diameter and 190 feet long were constructed. Shafts were sunk on the galena deposit and on the zinc blende deposit. In November, fifty tons of ore was concentrated yielding 10,713 pounds of concentrates which were found to contain 25·3 per cent lead, 22 ounces silver, and 3 pennyweights gold per ton. The Report of the Department of Mines, 1900, page 58, states that the shafts were deepened and new levels started, that by crushing, sizing, and concentrating on Wilfley tables a very satisfactory separation of the galena was made. The following assays were given:

	Lead %	Gold, oz. per ton	Silver, ozs.
Unroasted product before concentration..	20·78	0·133	18·1
Unroasted concentrates..	52·97	0·40	37·2
Tailing..	1·95	0·10	5·1

The report for 1901, page 70, states that profitable concentration presented some difficulties, which it was believed they had overcome, and arrangements were made for putting in a compressed air plant and improved milling and concentrating machinery.

Grandin Brook Copper Deposit. This is situated on a small brook flowing into McLeod brook, a tributary of L'Abime brook. Here there are several beds, probably 250 feet thick, of sericite and chlorite schists, known as the copper schists. At their outcrops in Grandin brook they strike north-northeast and dip east-southeast at 45 degrees, but they are much contorted and faulted. These schists are impregnated with chalcopyrite, but there is an absence of arsenopyrite.

---

[1] Rept. Dept. Mines, Nova Scotia, 1898, "Ore Bearing Schists", p. 20.
[2] Rept. Dept. Mines, Nova Scotia, 1898, "Ore Bearing Schists", p. 21.
[3] Trans. Nova Scotian Inst. Sci., vol. XI, p. 359.
[4] Rept. Dept. Mines, Nova Scotia, 1898, "Ore Bearing Schists", p. 20.
[5] Rept. Dept. Mines, Nova Scotia, 1898, p. 51.

Chalcopyrite and pyrite occur in small lenses, and in sheet-like masses, the openings for which, it is thought, were formed by the spreading of the beds on account of pressure exerted parallel to the strata. The metallic contents have been leached from the schists to a depth of 5 to 15 feet. Below this is a zone of oxidized ore which passes gradually into a zone of unoxidised chalcopyrite.

The work done here consists of a slope at its most southerly outcrop and some openings and stripping. In 1905, it was owned by the Cheticamp Copper Company, Limited, Halifax.

Mountain Top. This deposit occurs in the deep gorge of McLeod brook near the mouth of the Grandin. It consists of the following beds beneath the copper schists:

(1) Chlorite schist. Thickness not known.
(2) Sericite schist, 4½ feet.
(3) Chlorite schist, 25 feet.
(4) Sericite schist, 50 feet.

No. 1 is harder than the normal chlorite schist and carries auriferous arsenopyrite and chalcopyrite lenses and veins. No. 3 is much softer and carries arsenopyrite and pyrrhotite; No. 2 carries auriferous arsenopyrite. From No. 4 samples of arsenopyrite have shown a gold content of $90 per ton.[1]

This was owned in 1905 by the Richfield Mining Company, Limited, Halifax.

Iron Cap. This is also on McLeod brook. A bed of chlorite schist forms an anticline the limbs of which dip east and west at low angles. Auriferous arsenopyrite and pyrrhotite occur in lenses and veins. The deposit may be divided into two zones, an upper in which pyrrhotite predominates, and a lower in which arsenopyrite is the principal ore. A tunnel has been driven into the ore-body 100 feet. In 1905, it was owned by the Richfield Mining Company, Limited, Halifax.

Silver Cliff. This is an argentiferous galena deposit on L'Abime brook about 1½ miles south of 'Galena'. The rock is chloritic schist resting on a corrugated sheet of white quartz, below which is a dark hornblendic rock showing an imperfectly developed schistose structure. This deposit was owned in 1905 by the Inverness Mining Company, Limited, Halifax.

Alluvial Gold

Alluvial gold has been reported occasionally from this district. On L'Abime brook[2] some panning has been done on a small scale, and perhaps some of the other brooks would yield a little gold, but generally the conditions are not favourable. The grade is steep and the valleys narrow. Some gold has been found in the lower part of the valley of the Cheticamp, and it is covered with boulders and gravel, but the rocks higher up have not been found to contain any appreciable quantity of gold and it is improbable that the alluvium is worth prospecting.

CLYBURN BROOK[3]

Clyburn brook in Victoria county, Cape Breton, empties into the Atlantic ocean about 40 miles north of Sydney. South Bay, the nearest post office, has a daily mail and telegraphic connexions with North Sydney.

The surface of northern Cape Breton falls naturally into two divisions: highlands and lowlands. The relief appears to be dependent upon the lithology. The highlands of pre-Carboniferous rocks (Precambrian?) cover the greater part of the interior at an elevation of 1,000 to 1,200 feet; the lowlands of Carboniferous rocks form a regular fringe along the shore and extend up the lower valleys of the main rivers. In the vicinity of Clyburn valley the two features, highlands and lowlands, are sharply defined, and the slope betwen them is steep and in many cases precipitous. In the interior the pre-Carboniferous topography is unbroken, gently undulating, with a relief of 100 to 200 feet. The lower part of Clyburn valley is flat, about a quarter of a mile wide, and is built up of alluvium. The walls of the valley rise up in talus slopes at about 35 degrees and end abruptly at the level of the highland. The stream and its tributaries cascade through narrow gorges from the highland to the lowland. In Clyburn valley, there are numerous outcrops of pre-Carboniferous rocks showing it to extend within a mile of the shore where it is covered by a thin veneer of Lower Carboniferous.

---

[1] Trans. Nova Scotian Inst. Sci., vol. XI, p. 358.

[2] Rept. Dept. of Mines, Nova Scotia, 1893, "Ore Bearing Schists", p. 23.

[3] Wright, W. J.: Geol. Surv., Canada, Sum. Rept. 1913, pp. 270-283.

The pre-Carboniferous system is composed of four distinct varieties of rocks: (1) a bedded series of dark slates and schist which have the structure of sedimentary rocks (Clyburn formation); (2) a batholith of grey, gneissoid quartz diorite, which has intruded the bedded series (Ingonish gneiss); (3) dark basic dykes cutting the bedded series and the quartz diorite; (4) a batholith and dykes of pinkish, biotite, muscovite granite intruded into all the above-mentioned rocks and overlain unconformably by the Lower Carboniferous (Franey granite).

The Lower Carboniferous consists of conglomerate, dolomitic limestone, gypsum, sandstones, and shales.

The Clyburn formation lies in the upper part of Clyburn brook. It consists of a series of slates and schists, having a bedded structure resembling sediments, with black and dark green colours prevailing, occasionally grey bands, and at least one band of sericite quartz schist. The microscope shows much of the composing material to be of volcanic origin. The beds have a general trend northeast and dip to the northwest at about 75 degrees. Generally a schistose structure is evident, the planes of schistosity being about parallel to the bedding. Jointing is very marked; the rocks break readily into rectangular blocks. Some of the dark beds show cubes of pyrite. Occasionally there is an irregular zone of pyritiferous white quartz in irregular lenses cutting the structure.

The Ingonish gneiss floors Clyburn valley from Blue brook to within one mile of the sea. The general appearance varies. The most common type is a grey, medium-grained, slightly gneissic, quartz diorite. The gneissoid structure is not very noticeable in some parts, but in others is very pronounced and grades into distinctly banded zones.

The Ingonish gneiss is characterized by a great many dyke-shaped masses of greenish basic material which follow the general trend of the gneissic structure. Some are dense at the contact with the gneiss and coarse grained in the central part. Quartz veins are numerous: banded quartz veins from 3 to 4 feet in width seem confined to Ingonish gneiss, following its general trend. Some are much shattered, splitting up into plates, some are associated with pyrite, others are pyrite free.

The Franey granite is a coarse, porphyritic granite, reddish in colour, made up of phenocrysts of pink orthoclase and microcline set in a groundmass of orthoclase, albite, quartz, biotite, and muscovite. Near the border the texture varies more, becoming in some cases pegmatite, and in others aplite. The joint planes are straight and well spaced and the rock breaks into large, rectangular blocks. One body of the Franey granite lies north of Clyburn brook with its southern boundary running roughly parallel to the river from Dauphine book almost to the sea; this body probably extends several miles north. Another area occurs at Smoky mountain. Dykes of Franey granite are common and cut all other rocks except the Lower Carboniferous. The dykes are very irregular in form and size and commonly zigzag across the structure in all directions, pinching out to persistent red threads.

The metalliferous deposits are all associated with the pre-Carboniferous igneous rocks. The lead at the Franey mine follows the general structure of the Ingonish gneiss. It is made up of interbanded pyritiferous zones of bluish white quartz veins and gneiss, and divided into two parts by a dense, lamprophyric dyke that follows the general trend of the veins. Gold appears to be associated with pyrite in the quartz and gneiss walls; the lamprophyric dyke carries only traces of gold. The mineralized zone terminates abruptly to the east in a brecciated fault zone in Franey brook. It is limited to the north by a well-defined hanging-wall dipping north 75 degrees. The southern and western limits have not been determined. The Franey granite is barren of gold. In the quartz the pyrite is segregated in pockets and irregular zones parallel to the vein and shows a marked tendency to follow the greenish lines in the veins. No free gold has been seen, although assays of rich specimens have shown values as high as $130 a ton. A ton sample which included considerable dyke rock assayed $3.31 per ton gold. The general results of tests show that the average ore concentrates to approximately 10 per cent of the original and that the concentrates average approximately $50 per ton. Along the strike the zone of quartz is fairly regular in width averaging about 2 feet. The values vary along the strike; two high-grade zones were opened in the last 60 feet of the lower tunnel.

Gold was discovered in a large boulder by J. H. Brown in May, 1910, and in the following September he located the outcrop of the lead on the west bank of Franey brook, on which the mine is located. In the following October J. H. Brown, O. Theriault, J. Gannon, and H. M. Rogers organized a company and carried on development. In August, 1911, Theriault and J. C. C. Brodeur took an option on property on the east side of Franey brook, hoping to locate the lead there, $4,000 was spent prospecting with negative results.

About 900 feet of tunnel was driven and 60 feet of shaft sunk. Of this 270 feet of tunnel and 30 feet of shaft are on the lead at Franey brook. The remainder of the work was done in an attempt to locate the lead at other points and in prospecting other veins in the vicinity.

MIDDLE RIVER OR WAGAMATKOOK

Location

Middle River district is situated in Victoria county on Middle river and about 15 miles from Baddeck. Finlayson is the nearest postoffice. It includes a strip of land lying along a short portion of Middle river, and the area drained by four small tributaries, the First, Second, Third, and Fourth Gold brooks. These brooks are named according to the order in which they are met in ascending Middle river; they have a generally westward flow, and are from half a mile to a mile apart. The country is a flat upland 700 to 900 feet above sea-level. The brooks follow to a great extent the structure of the rocks and in their lower courses have cut deep, narrow valleys.

Geology

"So[1] far as seen, the glacial drift that mantles the bedrock throughout the lowland areas does not reach the Gold brooks." A clue to the different formations can, therefore, be obtained by a study of the loose material overlying them.

The rocks of this area consist of schists, shales, and slates of Precambrian age along with intrusives of various kinds. The lower half-mile of First brook, as well as Middle river below this point, flows over rocks of Carboniferous age, from which the country rises with a rather steep grade to the Precambrian plateau.

Along Middle river between the Gold brooks are outcrops of chloritic and sericitic schists. In the lower courses of First and Second Gold brooks is a garnetiferous gneiss containing much chlorite and sericite. In Second Gold brook, where these schists are exposed as far as 2,000 feet from its mouth, the beds are knotted and crumpled and manifest early stages in the formation of garnets. The foliation and bedding planes coincide and the strike is fairly uniform and persistent in an east and west direction. The variation in strike on Second brook due to crumpling is only local. The strata dip to the north at high angles. South of this is a mass of hornblende syenite, 100 feet wide, much weathered, and under the microscope seen to consist of orthoclase feldspar, biotite, a large amount of hornblende, and a little apatite. These minerals show dynamic distortion. This syenite grows wider towards the east, but has not been recognized on First brook at the west. South of this intrusive is a peculiar black schist which may be a more metamorphosed portion of the series of schists already described or may be of quite different origin.

Following[3] this, and about 2,500 feet from the mouth of Second brook, is a dyke of quartz porphyry 15 to 30 feet wide. This outcrops on First brook from which it has been traced eastward 3½ miles. It has the same east and west strike as the schists, but appears to dip at a slightly higher angle. The main part of the dyke carries phenocrysts of quartz and a few orthoclase embedded in a fine-grained pinkish groundmass, whereas the margin, which shows a banded structure parallel to the contact, is destitute of phenocrysts, takes on a felsitic appearance, and is pinkish brown in colour. It is only this marginal phase that is exposed in First brook. Under the microscope evidence of resorption of the quartz crystals is seen. They are surrounded by a thick rim of quartz particles and a brown, polarising mineral with regular crystal outlines. There are also tufts of radiating fibres of a brown, non-polarising mineral, which, with some plagioclase, constitute the groundmass.

---

[1] Rept. Dept. of Mines, Nova Scotia, 1898, "Ore Bearing Schists", p. 23.

[2] Woodman, J. E.: Rept. Dept. of Mines, Nova Scotia, 1898, "Ore Bearing Schists", p. 7.

[3] Rept. Dept. of Mines, Nova Scotia, 1898, "Ore Bearing Schists", p. 9.

Beyond this dyke and extending a mile from the mouth of the river are outcrops of schists similar to those near the mouth of the brook, but dipping at a higher angle. To the south of this is a mass of granitite from which the schists dip off steeply to the north. This granitite is very acidic, is friable, quite coarse, and of a red colour.

The general sequence of rocks is the same on Third and Fourth brooks as on Second brook.

Character of the Deposits

The vein that has received most attention is the Lisard lode which is found on Second brook about a mile from its mouth. It[1] is composed of quartz and carries in places arsenopyrite, chalcopyrite, galena, and other sulphides. The following is an analysis of a sample of concentrate:

Arsenic	26·26	per cent
Iron	35·36	"
Sulphur	27·46	"
Silica, alumina, etc	8·68	"
Nickel	trace	
Gold	2·14	ozs. per ton
Silver	2·46	ozs. "

Platinum is said to have been found in the alluvium, also waterworn[2] nuggets of native bismuth from the size of a grain of wheat to that of a pigeon's egg.

In form the vein is very irregular. In width it varies from a fraction of an inch to 6 feet. It often shows a banded structure parallel to the margins, and drusy cavities near the centre. It has about the same strike as the strata, and its dip varies from nearly vertical to nearly horizontal. It occurs in the schist, but the hornblende syenite lies close to the foot-wall. One wall is fairly well defined, sometimes the foot-wall and sometimes the hanging-wall.

There are[3] several quartz veins in the vicinity of Lisard lode, a few crossing the bedding, but the most being conformable with it. Near the porphyry dyke also are numerous quartz veins, which decrease in number with distance from the dyke. The mineralization of both the bedded and cross veins near the dyke is different from that in other parts of the schist series.

Close to the opening of the glen on First brook are several quartz veins, much stained with limonite, and in the vicinity of the porphyry dyke are a few barren veins, although much quartz is scattered over the hillside and in the brook. On Third and Fourth brooks are a few quartz veins.

Some attempts have been made to mine the alluvium in this district. It is said that some gold has been obtained in Middle river for a considerable distance below First brook, but it is improbable that it will prove economical. In the flats between First and Second brooks is an area that may contain gold carried from Second brook. In the lower part of First brook, where its valley widens, some alluvium had accumulated, but the most promising alluvial deposit is probably at the mouth of Second brook, inasmuch as this stream crosses what are apparently the most highly auriferous veins.

History and General Development

Fletcher[4] reports that a farmer, named Morrison, was the first to call the attention of the Government to the gold of this district, for which he received an area on one of the brooks free, and he became one of the most successful in washing out gold. On the other hand Heatherington[5] states that J. G. McLeod received a free claim in April, 1864, which implies that he was the original discoverer. J. Campbell, in his report dated February 25, 1863, relates that he washed gold from the sand of Middle river, and expresses the opinion that work skilfully conducted here should prove remunerative.

The prospect seemed so promising that in 1863 the Chief Gold Commissioner recommended that this locality be proclaimed a gold district. The district did not come up to expectations, however, and little work was done, owing, it was thought, to its inaccessibility. The first attempt,[1] on an extensive scale, to test the gold in Middle river, was made in 1867 by an American company. They constructed sluices near McLennan's bridge, on the Margaree road, washed the alluvium during the summer, but discontinued their work, as the receipts did not cover expenses. In 1870, a Mr. Wright and others tested all the brooks above McLennan's bridge by means of cradles, sluices, and pans. They also started a shaft in the main river to reach bedrock, but an influx of water compelled them to desist. The largest nugget found is said to have been worth $12 to $15, but generally they ranged in value from 50 cents to $2. In several cases gold was found adhering to quartz. In[2] 1868, several auriferous veins had been found and a crusher was in the course of erection, but we find no record that returns were ever made from it.

---

[1] Rept. Dept. of Mines, Nova Scotia, 1908, p. 108.

[2] How, H.: "Mineralogy of Nova Scotia", p. 63.

[3] Rept. Dept. of Mines, Nova Scotia, 1896, "Ore Bearing Schists", p. 9.

[4] Geol. and Nat. Hist. Surv. and Museum of Canada, Rept. of Prog. 1882-84, pt. H, p. 97.

[5] "Guide to the Gold Fields of Nova Scotia", p. 67.

In 1902 the placers were worked by Chinese, and Mr. Scranton mined the Lizard lode into which he had driven a long tunnel. For several years the Great Bras d'Or Gold Mining Company carried on mining operations. Adits were driven on the vein on both sides of the brook, an inclined shaft was carried to a depth of 140 feet, and stoping done on three levels. In 1922 the alluvial deposits again received some attention.

Production

Year	Gold extracted			Ore crushed	Yield per ton of 2,000 lbs.		
	Oz.	Dwt.	Gr.	Tons	Oz.	Dwt.	Gr.
1908	590	9	19	2,800		4	5
1909	708	0	0	1,783		7	22
1910	38	5	0	336		2	7
1911	23	4	0	125		3	17
1914	262	17	13	775		6	19
1915	41	14	19	274		3	1
1916	5	10	0				
	1,670	1	3	6,093			

WHYCOCOMAGH

Location

Whycocomagh district lies in Inverness county, 1½ miles north of the village of Whycocomagh at the head of St. Patrick channel.

Geology

On a hill here is exposed a series of rocks of Precambrian age consisting of quartzite,[3] diorite, syenite, quartz-felsite, calcareous breccia, and crystalline limestone. Surrounding these are Lower Carboniferous sediments. Some work has been done in these ancient rocks near the head of the brook lying to the south of Mullach brook. A tunnel cut northward from the brook gives the following section[4]:

	Feet
1. Dark green schist	10
2. Limestone, strike N. 65° W. (mag.) dip 48° N.	15
3. Quartzite	100
4. Limestone to end of tunnel	15
	140

---

[1] Geol. and Nat. Hist. Surv. and Museum, Rept. of Prog. 1882-84, pt. H, p. 97.

[2] Rept. of Chief Gold Commissioner, Nova Scotia, 1868.

[3] Fletcher, H.: Geol. Surv., Canada, Rept. of Prog. 1882-84, pt. H, p. 34.

[4] Rept. of Dept. of Mines, Nova Scotia, 1898, "Ore Bearing Schists", p. 14.

The figures are only rough estimates and are not intended to represent the thickness of the strata. South of the tunnel, near its mouth, is more quartzite. Down the brook is a wide belt composed of alternations of quartzite and limestone, followed by 500 yards of coarse, pink granitite, which in turn is succeeded southward by quartzite to the edge of the Precambrian area. Northward from the tunnel the outcrops in the brook consist chiefly of limestone.

The contact[1] of the limestone and the dark green schist of the section given has the same strike and dip as the banding of the limestone. The schist at the contact is soft and crumbly and tongues into the limestone. The quartzite has a shear-zone at each contact. The quartzite is said to have been described by some as felsite, but "thin sections under the microscope show a fragmental character, the quartz grains and secondary quartz being easily seen. The grains are extremely fine, and interlock closely." The cement consists of quartz, calcite, and some undetermined mineral.

Character of the Deposit

"The ore[2] throughout this region consists, to the eye, chiefly of massive and granular arsenopyrite. Here and there is a little pyrite or chalcopyrite, but these are not abundant. The sulphides sometimes occur in veins of quartz, but usually in the country rock without gangue. Where the limestone is mineralized, the metals lie along the planes of schistosity, and their general distribution appears to bear no relation to the presence or absence of veins. The chief part of the ore is to be found in the quartzite; and where the limestone contains sulphides, quartzite is usually not far distant. In places where this rock appears to merge into the dark green schist, the ore runs for some distance into the latter; but as a rule the schist is barren. Almost all the quartzite is impregnated with arsenopyrite to such an extent that particles of it are visible in every piece. Frequently, however, the mineral is concentrated in bands or lenses, roughly parallel with the contacts of the quartzite with its neighbours. A number of these lenses cross the brook or are visible on its side within half a mile north of the tunnel. In a few cases distinct lenses are visible in quartz veins. At a distance from the tunnel an increasing proportion of pyrite and chalcopyrite appears." Assays of some samples taken by Woodman showed traces of gold but no silver.

Genesis

Although it has been stated that the connexion of the ore was with the metamorphic limestone Woodman is of the opinion that the metallic compounds were carried into the unaltered sandstone by solfataric action, and were possibly concentrated by the agencies that converted the sandstone into a quartzite.

General Development

There was some excitement in the latter part of 1897 and the early part of 1898 over the discovery of the mispickel, which it was claimed was very rich in gold, and a tunnel 140 feet long was cut, but work was not long continued. Sluicing on a small scale has been carried on with success, but the valley of the brook will not permit of the accumulation of much alluvium. It is thought that two or three men could earn labourers' wages from it. The valley of Mullach brook widens out after leaving the Precambrian area and considerable alluvium has accumulated. Pits have been sunk which show it is 4 feet deep, and in some places more than that. The material, which is never very fine, varies much in texture and consists of granite, pink and grey quartzite and quartz pebbles, with quartz sand carrying garnets and magnetite. It is claimed that it yields $2 to $3 per ton, and that the gold is not in flakes, but is in fairly coarse, irregular masses.

---

[1] Rept. Dept. of Mines, Nova Scotia, 1898, "Ore Bearing Schists", p. 14.
[2] Rept. Dept. of Mines, Nova Scotia, 1898, "Ore Bearing Schists", p. 15.

CHAPTER VII

ANTIMONY

WEST GORE

Location. An ore deposit that has assumed some importance is that of the auriferous stibnite at West Gore. The mine is situated in Hants county, 3 miles by wagon road southeast from Clarksville, a station on the Midland division of the Dominion Atlantic railway.

Geology. The rocks of the Halifax formation, which is here exposed, are light grey in colour, and are described by some as talcose. They are not well exposed in the immediate vicinity of the mines, but sections can be seen on Murdock brook, a short distance east, and along Glen brook, running some distance west of the mines. The strata strike northeast and dip southeast at an angle of about 45 degrees. South of the mines is a 200-foot belt of rocks composed largely of quartzite. There has been considerable faulting. No igneous rocks are to be found near the deposit.

Character of the Deposit. There are three veins, nearly parallel and running north 55 degrees west. The main vein is the middle one, and it lies about 1,000 feet from the vein to the southwest and about 700 feet from the one to the northeast. They occupy fault planes. The ore consists of stibnite, with which is associated native antimony, pyrite, mispickel, and coatings of kermesite and valentinite. The gangue consists of crushed slate, quartz, and a little calcite. The native antimony occurs throughout the ore zone in small stringers and bunches, and was found quite abundant on the sixth level. For a number of years it was believed that antimony was the only valuable product to be obtained from these veins; the later discovery, that they also carry considerable gold, greatly enhanced the value of the deposits.

The ore-shoots are not well defined, but their general dip is in approximate accord with the dip of the strata. All the veins at the surface and the main vein at the 400-foot level were found to pinch out on reaching a quartzite body to the south.

The southwest vein dips west 80 degrees and is 2 to 20 inches thick with an average thickness of 4 inches. The strata on the east side of the break are bent to the north and downward at an angle of 45 degrees with the horizontal, whereas on the west side they curve in the opposite direction, showing the fault to be a right-hand fault with the downthrow side on the west.

The northeast vein has an average width of 5 inches.

The middle vein has been traced 1,200 feet on the surface, and dips southwest 85 degrees. The ore[1] occurs in lenses 50 to 60 feet in diameter and 6 to 24 inches thick. When one lens peters out, a few feet of drifting brings in another, and the series forms a shoot pitching southeast 45 degrees. The foot-wall is irregular, and carries numerous stringers given off from the main vein; the hanging-wall is well defined and smooth. The ore[1] as a rule clings closely to the hanging-wall, but in a few places it splits and one part passes to the foot-wall and follows it some distance, and in some places the ore passes to the middle of the vein. At some depth the vein bifurcates and branches are given off on the northeast side that form a small angle with the main vein and run northwest and southeast. The one given off to the northwest carried some ore which was tapped by crosscuts from the fifth level. The gold is not found free except where an interbedded vein of quartz enters at No. 1 shaft.

---

[1] Haley, D. F.: Eng. and Min. Jour. vol. 86, p. 723, Oct. 9, 1908.

History and General Development

Antimony[2] ore was found in the drift in 1880 by John McDougall on his own farm, and trenching was commenced with a view to discovering its source, but as the prospectors were working on the supposition that the vein was an interbedded one, much fruitless labour was expended. During[3] the autumn of 1883 a vein was found, the ore was reported to be of excellent quality and in economic amount, and a large sample was shipped to Swansea. In 1884 two shafts, about 120 feet apart, were sunk 175 feet, levels were driven, and 600 tons of No. 1 ore raised. Work continued the next year and for several years with varying success, but in 1892 the mine was closed. In 1887 the vein to the southwest was discovered by Gould Northup, and in 1899 the one to the northeast was discovered by John McDougall.

The most of the work in the district has been limited to the middle vein. This was reopened in 1899, closed again in the spring of 1900, and reopened in January, 1903. Several shafts were sunk on this vein, but only three were carried to any considerable depth. These are numbered 1, 2, and 3, beginning with the one farthest southeast and going northwest. No. 3 was carried to a depth of about 170 feet, and No. 2, which is 220 feet southeast, was carried to a depth of 240 feet. No. 1, which is 156 feet southeast of No. 2, was sunk vertically 240 feet, a crosscut was made to the vein and the shaft was then inclined along the vein, and a raise at a greater angle from the vertical was made to the vertical section of the shaft. Levels were driven and the stoping carried to the southeast, keeping in touch with the main pay-shoot. The following table shows the extent of the workings in 1907, along with the work done that year[4]:

---

[1] Askwith, W. R.: "The West Gore Antimony Deposits;" Trans. Min. Soc. N.S., vol. VI, p. 81.

[2] Askwith, W. R.: Trans. Min. Soc., N.S., vol. VI, p. 80.

[3] Rept. of the Dept. of Mines, Nova Scotia, 1883, p. 24.

[4] Rept. of Dept. of Mines, Nova Scotia, 1907, p. 106.

Number of level	Depth	Present length		Driven during the year	
		East	West	East	West
1	113	122	160	0	0
2	228	44	160	0	78
3	318	182	432	0	182
4	410	342	763	0	246
5	492	290	179	0	0
6	586	18	269	0	22
7	662	57	447	0	190
8	769	124	200	124	200
Shaft	502 ft.	Sinking none			
Winze	332 "	Sinking 150			

The shaft was sunk 502 feet, and 257 feet southeast of the shaft a winze was sunk from the fifth level, and from this the sixth, seventh, and eighth levels were driven. The most of the ore that has been raised was taken from between the surface and the fifth level. Operations[1] were discontinued in the spring of 1908, but the St. Helen's Smelting Company commenced work in August, 1909, preparatory to reopening the mine acquired from the Dominion Antimony Company.

In 1910 and 1911 the West Gore Antimony Company, formerly the Dominion Antimony Company, operated the mill; in 1910, 5,566 tons of the dump was treated and 203 tons of concentrates obtained; and in 1911, 2,004 tons was treated and 191 tons of concentrates obtained.

Mining operations were carried on in 1915, 1916, and 1917. The shaft was carried to a depth of 850 feet and a winze was started on the 850-foot level. The sixth level was driven west of the shaft to a length of 360 feet, the eighth level was driven west and connected with the shaft, the 850-foot level was driven 185 feet west of the winze, the fourth level was driven 300 feet east, the fifth level was driven 330 feet east, a winze was sunk from the fourth level 35 feet and levels driven east and west from the bottom of the winze, raises were made from the fifth to the fourth level and raises were made from the 300-foot level, one of 100 feet and one of 60 feet.

In 1915 stoping was carried on on the sixth and seventh levels and 10,782 tons of ore milled, yielding 783 tons of concentrates. In 1916 the third level east of the shaft, the seventh level east and west of the shaft, and the eighth level west of the east winze and at the shaft, were stoped and from 14,149 tons of ore 856 tons of concentrates were obtained. In 1917 the fourth and fifth levels and the east end of the second level were stoped and from 10,660 tons of ore 533 tons of concentrates were obtained.

In 1917 exploration by diamond drilling was carried on. In a hole driven 605 feet north horizontally from the fifth level beds of bluish slate with thin beds of quartzite were cut; in a hole driven 422 feet south horizontally from the fourth level east, beds of bluish slate and quartzite were cut; and in a hole started on the surface 415 feet east of the shaft and sunk 378 feet in a direction south 30 degrees east quartzite and slate bands were cut with indications of antimony at 321, 327, and 331 feet.

---

[1] Rept. of Dept. of Mines, Nova Scotia, 1908, p. 1[illegible]

Little work has been done on the other two veins. On the vein[1] to the northeast a 55-foot shaft was sunk in 1899. With regard to the vein to the southwest commonly known as the Brook vein, the Report of the Department of Mines, Nova Scotia, for 1899, states that some first-class ore was taken out during the season, but work had ceased, and the report for 1906 states that the shaft was being unwatered for the purpose of sinking and driving.

Float antimony ore has been found to the northwest and to the southeast of the mines, but much of it has probably been carried from the veins by workmen.

Antimony minerals have been detected in some of the auriferous veins of the province.

Production

Year	Tons	Gold		
		Oz.	Dwt.	Gr.
1884 (year ending Dec. 31)	463			
1885	758 (exported)			
1886	645 "			
1887	550			
1888	308 (exported)			
1889	30 "			
1890	265 (from dumps)			
1891	10 (exported)			
1905 (year ending Sept. 30)	4,000 (527 tons shipped)	1,232	16	23
1906	783	1,031	13	11
1907	3,042 (1,403 tons shipped)	1,319	18	12
1908	133	179	5	10
1910	203	350	4	15
1911	191	398	16	21
1915	683	1,698	5	0
1916	856	602	18	4
1917	180	141	2	14
	4,959	6,955	1	0

---

[1] Rept. of Dept. of Mines, Nova Scotia, 1899, p. 57.

APPENDIX I

STATISTICS

Gold Production of the Province from 1862 to 1927[1]

Year	Material crushed	Total gold extracted		
	Tons	Oz.	Dwt.	Gr.
1862	6,641	7,275	0	0
1863	17,002	14,001	14	17
1864. (9 months only)	15,316	14,565	9	8
1865	23,835	24,867	5	12
1866	30,963	24,162	4	13
1867	30,673	27,583	6	9
1868 (15 months)	39,853	27,403	13	7
1869	35,424	17,868	0	19
1870	30,502	19,866	5	6
1871	31,287	19,227	7	4
1872	17,173	13,079	3	10
1873	17,708	11,852	7	19
1874	13,844	9,140	13	9
1875	14,810	11,208	14	19
1876	15,490	12,038	13	18
1877	17,369	16,882	6	1
1878	17,990	12,577	1	22
1879	16,026	13,801	8	22
1880	14,037	13,234	0	4
1881	16,556	10,756	13	2
1882	21,081	14,107	3	20
1883	25,954	15,446	9	23
1884	25,186	16,079	14	10
1885	28,890	22,203	12	20
1886	29,010	23,362	15	15
1887	32,280	21,211	17	18
1888	36,178	22,407	3	10
1889	39,160	26,155	6	13
1890	42,749	24,358	9	9
1891	35,012	22,251	2	9
1892	32,552	19,998	3	6
1893 (9 months only)	30,241	14,723	11	7
1894	39,333	14,980	7	4
1895	58,082	22,112	17	21
1896	67,249	26,112	16	22
1897	76,494	26,615	14	21
1898	86,451	31,112	18	0
1899	104,122	27,772	2	3
1900	85,744	30,400	4	14
1901	87,992	30,537	4	0
1902	102,076	28,279	5	13
1903	92,645	25,198	4	18
1904	62,616	14,279	8	14
1905[2]	72,252	16,782	11	5
1906[2]	65,278	14,079	13	23
1907[2]	66,060	15,007	5	8
1908[2]	59,797	11,991	0	0
1909	59,058	12,597	12	13
1910[2]	49,558	10,675	13	16
1911[2]	18,319	8,389	12	4

---

[1] Table by J. P. Messervey, Department of Mines, Halifax.

[2] Including gold from stibnite ore shipped from West Gore.

Gold Production of the Province from 1862 to 1927—(Continued)

Year	Material crushed	Total gold extracted		
	Tons	Oz.	Dwt.	Gr.
1912	15,868	4,948	19	20
1913	7,324	2,364	12	22
1914	13,156	3,158	4	10
1915[1]	25,104	7,216	1	20
1916[1]	18,354	4,963	7	9
1917[1]	5,916	2,295	16	5
1918	1,630	1,279	3	11
1919	1,362	935	13	8
1920	858	744	10	15
1921	1,650	378	17	6
1922	4,837	865	6	13
1923	2,273	535	11	13
1924	1,779	750	3	3
1925	7,749½	1,526	3	3
1926	7,224½	1,350	10	7
1927	15,847	2,306	12	11
	2,184,850	966,241	8	12

---

[1] Including gold from stibnite ore shipped from West Gore.

Gold Production from 1862 to 1927 According to District[1]

District	Ore crushed	Total yield of gold		
	Tons	Oz.	Dwt.	Gr.
Beaver Dam	191	105	6	18
Blockhouse	1,029	1,788	0	0
Brookfield	102,339	42,251	3	8
Caribou	233,594	66,077	9	1
Carleton	58	37	15	2
Central Rawdon	13,323	9,820	9	4
Cow Bay	899	803	4	7
Ecum Secum	30	4	13	0
Fifteenmile brook	1,908	488	13	2
Fifteenmile stream	40,813	19,043	16	5
Gays River	11,877	1,878	16	15
Gold River	2,971	3,006	14	18
Harrigan Cove	13,052	7,920	13	23
Kemptville	1,570	956	3	5
Killag	936	1,412	7	16
Lake Catcha	25,370	17,559	12	17
Lawrencetown	865	488	2	6
Leipsigate	37,915	12,936	9	22
McKay Settlement	12	1	16	14
Malaga	24,308½	20,462	7	3
Miller lake	39	17	0	0
Mill village	1,057	742	0	0
Montague	28,064½	45,698	14	0
Oldham	62,761	71,712	2	5
Ovens	102	441	6	14
Pleasant River Barrens	30	19	17	0
Renfrew	62,282	49,029	7	1
Salmon River	110,576½	35,301	1	21
Shears point (Moosehead)	999	185	19	12
Sherbrooke	398,912¼	168,986	8	16
Stormont	556,167¾	127,824	9	12
Tangier	57,350	29,364	9	1
Uniacke	66,029	46,311	9	20
Wagamatkook (Middle River)	6,093	1,670	1	3
Waverley	151,862½	69,688	19	22
West Caledonia (mortared)	....	1	13	12
West Gore (Antimony)	4,959	6,955	1	0
Whiteburn	6,992	9,984	6	18
Wine Harbour	76,544	40,712	18	11
Mortared	0	84	17	23
Unproclaimed, etc	80,970	54,465	9	17
	2,184,851	966,241	8	10

---

[1] Table by J. P. Messervey, Department of Mines, Halifax.

APPENDIX II

BIBLIOGRAPHY

1829 Haliburton, Thomas C.: "An Historical and Statistical Account of Nova Scotia", Halifax. Geology and mineralogy in vol. II, pp. 414-453.
Rocks of the Gold-bearing series were believed to be trap rock and clay slate, the former "sometimes apparently interstratified with the clay slate, but generally in confused masses."

1832 Jackson, Charles T. and Alger, Francis: "Remarks on the Mineralogy and Geology of Nova Scotia;" Mem. of the Am. Acad. of Arts and Sci., new series, vol. I, pp. 217-330.
Deals chiefly with the trap rock of North mountain. Last few pages devoted to the slate and quartzite of the Atlantic coast. Accompanied by a geologically coloured map.

1836 Gesner, Abraham: "Remarks on the Geology and Mineralogy of Nova Scotia." Halifax. Pp. 272.
Discusses the geology of the province, making four divisions: Primary district; Clay Slate district; Red Sandstone district including the coal fields; and the Trap district. Describes the rocks outcropping in different localities. Is accompanied by a coloured geological map.

1849 Gesner, Abraham: "The Industrial Resources of Nova Scotia." Comprehending the physical geography, topography, geology, agriculture, fisheries, mines, forests, wild lands, lumbering, manufacturies, navigation, commerce, emigration, improvements, industry, contemplated railways, natural history, and resources, of the province. Halifax. Pp. 341.

1855 Dawson, J. W.: "Acadian Geology." An account of the geological structure and mineral resources of Nova Scotia, and portions of the neighbouring provinces of British America. Edinburgh. Pp. XII-388.
Treats of modern alluvial deposits, the "New Red Sandstone," the Carboniferous, Devonian, and Silurian systems and the metamorphic district of the Atlantic coast. The last chapter is concerned with a discussion of the geology and the age of the rocks of this metamorphic district. Accompanied by a geological map.

1861 Marsh, O. C.: "The Gold of Nova Scotia." Am. Jour. Sci., 2nd. series, vol. XXXII, pp. 394-400.

1861 Dawson, J. W.: "On the Recent Discoveries of Gold in Nova Scotia." Can. Nat., vol. VI, pp. 417-430.

1862 Campbell, J. S. and Poole, H.: "Report on the Gold Fields": Eastern Section by Campbell, Western Section by Poole.
Additional papers on the Nova Scotia gold fields including Messrs. Poole and Campbell's reports.
(A report to the Commissioner of the Crown Lands Department) Halifax, 36 pp. Mr. Poole's report, pp. 4-22; Mr. Campbell's report, pp. 29-36. Same Jour. of Assembly, 1862. App. No. 2, 33-68.

1862 Poole, Henry: "Report on the Gold Fields, Western Section." Halifax. Pp. 25.

1863 Campbell, J.: "Nova Scotia Gold Fields." (To the Honourable Joseph Howe, Provincial Secretary). Halifax. P. 12.
Divides the gold-bearing rocks into two groups, slate and quartzite, describes the folding, discusses the question of alluvial deposits, and gives the result of explorations. Accompanied by a cross-section.

1864 Silliman, B., jun.: "On the So-called 'Barrel Quartz' of Nova Scotia." Am. Jour. Sci., 2nd series, vol. XXXVIII, pp. 104-106.

1864 Silliman, B., jun.: "Report on the Gold Property of the New York and Nova Scotia Gold Mining Company with an Introduction on the General Structure and Geology of the Nova Scotia Gold Fields." New York. Pp. 56. In the introduction is a careful consideration of the general and economic geology of the gold fields. This is followed by a general description of the property owned by the New York and Nova Scotia Gold Mining Company and details regarding the treatment of the ores.

1865 Logan, W. E.: Atlas of maps and sections to accompany Report of Progress, Geological Survey, Canada, from its commencement to 1863.

1866 Logan, W. E., and Hall, J.: Geological map of Canada and part of the United States from Hudson bay to Virginia, and from the Missouri river to Newfoundland.

1866 Logan, W. E.: Geological map of Canada and adjacent regions. 25 m=1 inch.

1868 Dawson, J. W.: "Acadian Geology," 2nd edition, revised and enlarged, with a geological map and numerous illustrations. London, Edinburgh, Halifax, and Montreal. Pp. XXVII-694.

1868 Hunt, T. Sterry: "Report on the Gold Region of Nova Scotia." Geol. Surv., Canada, 1868, pp. 48.

Deals with the geology of the fields, the nature and origin of the auriferous veins, the method of treating the ore, and the structural and economic geology of the different districts.

1868 Heatherington, A.: "A Practical Guide for Tourists, Miners, and Investors and All Persons Interested in the Development of the Gold Fields of Nova Scotia." Montreal. Pp. 170.

Contains a succinct account of the discovery of gold in the province, a brief chapter on each proclaimed district, in which is given its location, history, development, and relative importance. Synopses of geological reports are given, descriptions of metallurgical treatment, and tables of statistics.

1868 How, Henry: "The Mineralogy of Nova Scotia, a Report to the Provincial Government." Halifax. Pp. 216.

Describes the mineral resources of the province. Pages 37-57 deal with the character of the gold deposit along with a short paragraph on each mining district, noting its status.

1869 Hind, H. Y.: "Report on the Waverley Gold District," with Geological Maps and Sections. Halifax. Pp. 62.

Discusses the structural geology of the district, the structure of the leads with the distribution of the gold, and the identification of gold-bearing groups of leads in different districts. Accompanied by a plan on the scale of 600 ft.=1 inch.

1869 Hind, H. Y.: "Notes on the Structure of the Nova Scotia Gold District." Trans. N.S. Inst. Nat. Sci., vol. II, pt. 3, pp. 102-109.

1870 Hind, H. Y.: "On Two Gneissoid Series in Nova Scotia and New Brunswick, Supposed to be the Equivalents of the Huronian (Cambrian) and Laurentian." Quart. Jour. Geol. Soc. London, vol. XXVI, pp. 468-479. Map.

1870 Hind, H. Y.: "On the Laurentian and Huronian Series in Nova Scotia and New Brunswick." Am. Jour. Sci., 2nd series, vol. XLIX, pp. 347-355.

1870 Hind, H. Y.: "Report on the Sherbrooke Gold District." Together with a Paper on the Gneisses of Nova Scotia and an abstract of a paper on Gold Mining in Nova Scotia. Halifax. Pp. 79.

In the paper on the gneisses he considers the granite as metamorphosed sediments of Laurentian age and the gneisses and schist in contact with the granite as Huronian. The report on Sherbrooke includes a classification of the veins and a theory of their origin. Attention is called to the loss of gold in the sulphides in the tailings. Large scale plans and sections accompany the report.

1872 Selwyn, A. R. C.: "Notes and Observations on the Gold Fields of Quebec and Nova Scotia." Geol. Surv., Canada, Rept. of Prog. 1870-71, pp. 252-282.

Treats of the geology and age of the series, also of the origin and age of the veins, of the causes of the depression in the industry, and of the probability of the occurrence of profitable placers. As opposed to Hunt and Hind he maintains the veins are later than the rocks.

1872 Hind, H. Y.: "Report on the Mount Uniacke, Oldham, and Renfrew Gold Mining Districts," with Plans and Sections. Halifax, pp. 136.

The general remarks deal with the metallurgical treatment of the ores, the distribution of the gold in the veins as shoots or chimneys; and the profitable mining of low-grade belts. There is a section of the report devoted to each of the three districts, in which is given a history of the district as compiled from the Chief Commissioner's reports, a description of the geology, and of the leads worked.

1878 Dawson, J. W.: "Acadian Geology, The Geological Structure, Organic Remains, and Mineral Resources of Nova Scotia, New Brunswick, and Prince Edward Island." Third edition. London.

Well-written and much referred to by geologists of today. Gives the results of investigations in the gold fields, and contains a supplement in which is a discussion of the age of the Gold-bearing series.

1879 Poole, Henry S.: Report on the Inspection of Mines in Nova Scotia, for the year ending December 31, 1878.

Report of the Department of Mines, Nova Scotia, for the year 1878. Halifax.

Pages 20-28 contain a strong and convincing argument in favour of the theory that the auriferous veins are of later age than the rocks.

1880 Gilpin, Edwin, jun.: "The Mines and Mineral Lands of Nova Scotia." Halifax. Pp. 127. Treats concisely of the mineral deposits of the province. Gold fields, pp. 30-51.

1880 Poole, H. S.: "The Gold Leads of Nova Scotia." Quart. Jour. Geol. Soc. London, vol. XXXVI, pp. 307-313.

1881 Murray, A., and Howley, J. P.: "Geological Survey of Newfoundland." London. Pp. 145, 146, 167. A consideration of the age of the rocks.

1882 Gilpin, Edwin, jun.: "The Gold Fields of Nova Scotia." Trans. of the North of England Inst. of Min. and Mech. Eng., vol. XXI, 1881-82.

A treatment of the geology, the character of the ore deposits, mining, milling, and metallurgy. Accompanied by map, plan of Waverley district, and five plates.

1882 Gilpin, Edwin, jun.: "The Gold Fields of Nova Scotia." Eng. and Min. Jour., vol. XXXIV, pp. 5-6, 17-18.

1886 Gilpin, Edwin, jun.: "The Nova Scotia Gold Mines." Trans. Am. Inst. Min. Eng., vol. XIV, pp. 674-689.

1886 Faribault, E. R.: "Report on the Lower Cambrian Rocks of Guysborough and Halifax Counties, Nova Scotia." Geol. and Nat. Hist. Surv., Canada, Ann. Rept. (new series), vol. II, pt. P, pp. 129-163 (1887).

A consideration chiefly of the geology of the area described.

1888 Gilpin, Edwin, jun.: "Notes on the Nova Scotia Gold Veins." Trans. Roy. Soc. of Canada, vol. VI, sec. IV, pp. 63-70.

Discusses the geology and the origin of the gold.

1891 Weston, T. C.: "Notes on Concretionary Structure in Various Rock Formations in Canada." Trans. N. S. Inst. Sci., vol. VIII, pp. 137-142.

1891 Walcott, C. D.: Correlation Papers, Cambrian. Bull. United States Geol. Surv., No. 81, pp. 56-59, 262, 380.

1892 Van Hise, C. R.: Correlation Papers. Archaean and Algonkian. Bull. United States Geol. Surv., No. 86, pp. 239-247, 503.

1893 Thomas, W. R.: "Notes on Practical Mining Applicable to some Gold Mining Districts in Nova Scotia." Trans. Min. Soc. N. S., vol. II, pt. 3, pp. 99-109.

1893 Hardman, John E.: "Recent Gold Milling Practice in Nova Scotia." Trans. Min. Soc., Nova Scotia, vol. I, pt. II, pp. 34-44. With plans and elevations.

1894 Woodhouse, Alfred: "The Occurrence and Reduction of Gold." Trans. Min. Soc., Nova Scotia, vol. II, pt. I, pp. 15-26.

1894 Hardman, J. E.: "Government Aid to Mining—A Suggestion." Trans. Min. Soc., Nova Scotia, vol. II, pt. III, pp. 110-114.

Suggests detailed topographical maps of each prominent gold district, with accompanying monographs in pamphlet form.

1894 Mason, F. H.: "Gold Chlorination. A Description of the Newbury Vautin Process." Trans. Min. Soc., Nova Scotia, vol. II, pt. IV, pp. 152-157. With two plates.

1895 Prest, W. H.: "Deep Mining in Nova Scotia." Proc. and Trans., Nova Scotian Inst. of Sci., Halifax, Nova Scotia, vol. VIII (vol. I of the second series) pp. 420-434 (1890-94).

1895 Rutherford, John: "Gold Mining in Nova Scotia—A Review of Operation in the Various Localities." Trans. Min. Soc., Nova Scotia, vol. III, pp. 125-135.

1895 Becker, George F.: "Reconnaissance of the Gold Fields of the Southern Appalachians." U.S. Geol. Surv. Extract from the Sixteenth Ann. Rept. of the Director, 1894-95.

Pages 74-82 discuss the age of the rocks and the origin of the gold in Nova Scotia.

1895 Hardman, J. E.: "On the Relative Costs of Mining Narrow Veins. Hand Drills vs. Air Drills." Trans. Min. Soc., Nova Scotia, vol. III, pp. 55-59.

1895 Wilson, B. C.: "Some Remarks on the Gold Production of Nova Scotia and How it May be Increased." Trans. Min. Soc., Nova Scotia, vol. III, pp. 60-65.

1895 Bailey, L. W.: "Preliminary Report on Geological Investigations in Southwestern Nova Scotia"; Geol. Surv., Canada, vol. VI, pt. Q.

1896 Chalmers, Robert: "Surface Geology of Eastern New Brunswick, Northwestern Nova Scotia, and a Portion of Prince Edward Island"; Geol. Surv., Canada, vol. VII, pt. M, pp. 149.

Pages 95-97 treat of glaciation of South and North mountains, claiming that the glaciation of the peninsula of Nova Scotia was local.

1897 Hardman, J. E.: "Gold Mining Industries." Nova Scotia. Can. Min. Iron and Steel Man., 1897. Compiled by B. T. A. Bell. Pp. 112-117, Ottawa.

A concise review of the industry.

1897 Andrews, C. F.: "Notes on the Mining of Low Grade Gold Ore in Nova Scotia"; Jour. of the Fed. Can. Min. Inst., vol. 2, pp. 5-12. Two plates.

1898 Prest, W. H.: "Glacial Succession in Central Lunenburg." Trans. N.S. Inst., vol. IX, pp. 158-170.

Gives sections.

1898 Gilpin, Edwin, jun.: "Ores of Nova Scotia. Gold, Lead, and Copper." Halifax.

Notes the method of occurrence, gives historical sketch of each district, and details of the costs of mining, also a contribution by F. H. Mason on 'Concentrates.'

1898 Mason, F. H.: 'Concentrates.' Ores of Nova Scotia. Gold, Lead, and Copper, by E. Gilpin, pp. 33-38.

Emphasizes the necessity of adopting methods of recovering the gold not amenable to amalgamation.

1898 Bailey, L. W.: "Report on the Geology of Southwest Nova Scotia, Embracing the Counties of Queens, Shelburne, Yarmouth, Digby, and Part of Annapolis"; Geol. Surv., Canada, Ann. Rept. (new series), vol. IX, pt. M. (1898).

Describes the glacial geology and the topography of the part studied. Subdivides the Gold-bearing series into a lower quartzite and two slate divisions and describes sections of these. Examines the schists and gneisses with a view to the determination of the age of the rocks at Yarmouth. Finds it impossible to mark the line of separation from the overlying Devonian rocks. Gives a few notes on the gold districts of the southwest.

1899 Hayward, A. A.: "Rapid Sinking in a Nova Scotia Gold Mine." Trans. Min. Soc., Nova Scotia, vol. IV, pp. 40-49.

1899 Libbey, W. L.: "Mining and Milling Costs in Queens County, N.S." Trans. Min. Soc., Nova Scotia, vol. IV, pp. 54-56.

1899 Woodman, J. E.: "Studies in the Gold-Bearing Slates of Nova Scotia." Proc. Boston Soc. Nat. Hist., vol. 28, No. 15, pp. 375-407. Boston.

1899 Faribault, E. R.: "On the Gold Measures of Nova Scotia and Deep Mining." Jour. Can. Min. Inst., vol. II, 1899, pp. 119-128. With diagrams, maps, and a section.

Republished with an introduction by Gilpin in pamphlet form by the Mining Society of Nova Scotia.

Gives a concise description of the geology of the gold fields, of the character of the ore deposits and their intimate relation to the general rock structure.

Owing to the apparent dependence of the ore deposition on peculiarities of rock structure and the similarity existing between the reefs of Bendigo and the veins of Nova Scotia, he strongly advises the adoption of a policy of deep mining.

1899 Prest, W. H.: "Deep Mining and Permanence of Paystreaks in Nova Scotia." Eng. and Min. Jour., vol. LXVII, pp. 495-496.

1899 Stuart, G. W.: "Nova Scotia Gold Mines." Eng. and Min. Jour., vol. LXVII, pp. 292.

1899 Selwyn, A. R. C.: "Gold Mining in Nova Scotia from 1860 to 1899." Jour. Can. Min. Inst., vol. II, pp. 162-165.

1899 Willis, C. E.: "A Peculiar Lode Formation." Trans. Min. Soc. N. S., vol. IV, pp. 22-26.

1900 Stuart, G. W.: "An Incident in Systematic Prospecting Connected with the Discovery of the Rose Lead, Montague, N.S."; Trans. Min. Soc., N.S., vol. V, pp. 25-27.

1900 Wilson, B. C.: "What Becomes of the Gold Run Out in the Tailings?" Trans. Min. Soc., N.S., vol. V, pp. 63-78.

1900 Stuart, Geo. W.: "Gold Mining in Nova Scotia"; Eng. and Min. Jour., vol. LXX, pp. 309-311.

1901 Askwith, W. R.: "The West Gore Antimony Deposits"; Trans. Min. Soc., Nova Scotia, vol. VI, pp. 80-86. Plan and section.

1901 Daly, R. A.: "The Physiography of Acadia"; Bull. Mus. of Com. Zool. at Harvard College, vol. XXXVIII, Geol. ser., vol. V, No. 3. With eleven plates.

1901 Gilpin, Edwin, jun.: "The Minerals of Nova Scotia." Halifax.

1903 Faribault, E. R.: "Deep Gold Mining in Nova Scotia. Report on the Best Methods of Testing the Value of the Deeper Gold Deposits of Nova Scotia." Halifax.

Classifies the veins of the different districts, and gives suggestions as to how the Government may secure the best results in the assistance offered to test the possibilities of deep mining. The appendix shows that there are auriferous veins that do not come to the surface at all. The report is accompanied by a number of sections.

1903 McLeod, R. R.: "Markland or Nova Scotia. Its History, Natural Resources, and Native Beauties."

Gives a history of each county and an account of the resources and industries.

1904 Forbes, H. L.: "Chlorination of Gold Ore of North Brookfield Mine"; Trans. Can. Min. Inst., vol. VII, pp. 306-318.

1904 McNulty, J. G.: "Observations on Gold Milling"; Trans. Min. Soc., Nova Scotia, vol. VIII, pp. 96-100.

1904 O'Shaughnessy, M. R.: "Stamp Milling Practice in Nova Scotia, and the Advantage of Introducing Water under Pressure below the Crushing Surfaces in the Gold Stamp Mill"; Trans. Min. Soc., Nova Scotia, vol. VIII, pp. 110-122.

1904 Woodman, J. E.: "Nomenclature of the Gold-Bearing Metamorphic Series of Nova Scotia"; Am. Geol., vol. XXXIII, pp. 364-370.

1904 Woodman, J. E.: "The Sediments of the Meguma Series of Nova Scotia"; Am. Geol., vol. XXXIV, July, 1904.

1904 Woodman, J. E.: "Geology of the Moose River Gold District, Halifax County, Nova Scotia"; Proc. and Trans. Nova Scotian Inst. Sci., vol. XI, pt. I, pp. 18-88.

A detailed description of the geology and of the character of the ore deposits. Well illustrated and accompanied by large scale plans and sections.

1905 Woodman, J. E.: "Distribution of Bedded Leads in Relation to Mining Policy"; Proc. and Trans. Nova Scotian Inst. Sci., vol. XI, pt. 2, pp. 163-178.

1905 Libbey, W. L.: "Government Aid to Deep Gold Mining in Nova Scotia"; Trans. Min. Soc., Nova Scotia, vol. IX, pp. 54-60.

1905 Libbey, W. L.: "The Cost of Plant, Shaft Sinking, and Level Driving in the Deepest Levels Yet Reached in the Gold Mines of Nova Scotia"; Trans. Min. Soc., Nova Scotia, vol. IX, pp. 94-96.

1907 Fulton, T. T.: "On the Lixiviation of an Auriferous Arsenopyrite Concentrate by Cyanide"; Trans. Min. Soc., Nova Scotia, vol. X, pp. 97-118.

1908 Woodman, J. E.: "Probable Age of the Meguma (Gold-Bearing) Series of Nova Scotia"; Bull. Geol. Soc. Am., vol. XIX, pp. 99-112. Three plates.

1908 Matthew, G. F.: "Geological Cycles in the Maritime Provinces of Canada"; Trans. Roy. Soc., Canada, third ser., vol. II, sec. IV, pp. 121-143 (1908-1909).

1908 Moore, Phil. H.: "Mine Pumping with Direct Connected, Electrically Driven Turbine Pumps"; Trans. Min. Soc., Nova Scotia, vol. XII, pp. 1-9.

1908 Brown, E. Percy: "The Development of an Ore Shoot in Nova Scotia"; Trans. Min. Soc., Nova Scotia, vol. XII, pp. 57-61. With sections.

1908 MacKenzie, T. G.: "Notes on the Mining Property of the Seal Harbour Mining Company"; Trans. Min. Soc., Nova Scotia, vol. XII, pp. 63-81.

1908 Stuart, Geo. W.: "Some of the Causes of the Present Condition of Gold Mining in Nova Scotia"; Trans. Min. Soc., Nova Scotia, vol. XII, pp. 85-90.

1909 Brown, E. Percy: "Notes on the Geological Structure at the Richardson Mine as Shown by Plans and Models of the Same"; Trans. Min. Soc., Nova Scotia, vol. XIII, pp. 17-26. With Plates.

1909 Ronnan, Fred. P.: "A Practical Suggestion for Testing the Gold Mines of Nova Scotia"; Trans. Min. Soc., Nova Scotia, vol. XIII, pp. 27-32.

1909 Haley, D. F.: "The Auriferous Antimony Ore of West Gore, Nova Scotia"; Eng. and Min. Jour., vol. 88, pp. 723-724.

1909 Brown, E. Percy: "How Can the Gold Mining Industry of Nova Scotia be Assisted"; Trans. Min. Soc., Nova Scotia, vol. XIII, pp. 33-37.

1909 Badger, H. S.: "Methods of Ore Handling at the Richardson Mines, Guysborough County, Nova Scotia"; Trans. Min. Soc., Nova Scotia, vol. XIII, pp. 83-97. One plate.

1914 Wright, W. J.: "Geology of the Neighbourhood of New Ross, Lunenburg County, Nova Scotia"; Geol. Surv., Canada, Sum. Rept. 1912, pp. 384-389.

1914 Wright, W. J.: "Geology of Clyburn Valley, Cape Breton"; Geol. Surv., Canada, Sum. Rept. 1913, pp. 270-283.

1924 Goldthwait, J. W.: "Physiography of Nova Scotia"; Geol. Surv., Canada, Mem. 140.

1924 Parsons, C. S.: "An Investigation of the Tailings and Rock Dumps at the Gold Mines of Nova Scotia, with a Review of the Past Mining and Milling Methods, the Present Status of the Gold Industry in the Province, and Some Suggestions for the Revival of the Industry"; Mines Branch, Dept. of Mines, Canada, Sum. Rept. 1922, pp. 162-170.

1925 Johnson, Douglas: "The New England-Acadian Shoreline."

1926 Brunton, Sir Stopford: "Gold Deposits of Nova Scotia"; Can. Inst. Min. and Met., Bull. 171, pp. 781-847.

1926 Brunton, Sir Stopford: "The Gold Deposits of Nova Scotia; a New Hypothesis Concerning the Structural Features of the Province"; Inst. Min. and Met., Bull. 258, 18 pp.

1926 Howe, J. Allen: "Discussion of a Paper by Sir Stopford Brunton Entitled "The Gold Deposits of Nova Scotia; a New Hypothesis Concerning the Structural Features of the Province"; Inst. Min. and Met., Bull. 259, pp. 34-36.

1926 Murray, J. C.: "Gold Mining in Nova Scotia"; Can. Inst. Min. and Met., Bull. 166, pp. 271-286.

1927 Faribault, E. R.: "The Gold Measures of Nova Scotia and Deep Mining" (reprint); Nova Scotia Dept. of Public Works and Mines, Report on the mines 1926, pp. 193-205.

1927 Hurst, M. E.: "Arsenic-bearing Deposits in Canada"; Geol. Surv., Canada, Econ. Geol. Series, No. 4.

1927 Murray, J. C.: "Gold Mining in Nova Scotia" (reprint); Nova Scotia Dept. of Public Works and Mines, Report on the Mines 1926, pp. 179-191.

1927 Rickard, T. A.: "Gold Mining in Nova Scotia"; Nova Scotia Dept. of Public Works and Mines, Report on the Mines 1926, pp. 163-177.

1928 Brunton, Sir Stopford: "A Survey of Certain Gold Districts in the Province of Nova Scotia." Nova Scotia Dept. of Public Works and Mines, Ann. Rept. on the Mines, 1927, pt. 2.

1928 Brunton, Sir Stopford: "Some Observations on a So-called Interbedded Vein at Tangier, N.S."; Can. Min. and Met., Bull. No. 194, pp. 784-803.

1928 Messervey, J. P.: "A Review of Gold Mining in Nova Scotia"; Nova Scotia Dept. Public Works and Mines.

Honeyman, D.: Numerous contributions to the Nova Scotian Institute of Science from 1867 to 1887. These are chiefly of the nature of notes on geological excursions.

Faribault, E. R.: The Summary Reports of the Geological Survey of Canada for the years from 1887 to the present, give the results of field operations. Important and somewhat detailed descriptions of the individual gold districts are found in the Summary Reports subsequent to 1896.

Ronnan, F. P.: A series of interesting articles on individual gold districts in the *Industrial Advocate*, beginning during the year 1896 and continuing through several volumes.

Reports of the Chief Gold Commissioner for the province of Nova Scotia for the years 1862 and 1863.

Reports of the Chief Commissioner of Mines for the province of Nova Scotia for the years 1864-1871.

Reports of the Department of Mines for the province of Nova Scotia for the years 1872-1927.

These reports contain much valuable information of a general character, as well as details of progress made in the different districts, and statistics.

Bailey, L. W.: Summary Reports of the Geological Survey, Canada, for 1891, 1893, 1895, and 1896. These give notes on the field work.

Maps, Plans, and Sections

The Geological Survey has published numerous geological maps and plans with accompanying sections based on surveys made by E. R. Faribault. The maps are published on a scale of 1 mile to 1 inch, cover a great part of the area underlain by the Gold-bearing series, and show the water system, the roads, buildings, the geological formations and their structure.

The plans of the gold districts are published on a scale of 250 feet or 500 feet to 1 inch, and show structural features, the location, size, and attitude of the quartz veins, and the location and depth of the shafts. Plans of the following districts have been published: Brookfield, Caribou, Carleton, Cochrane Hill, Cranberry Head to Chegoggin Point, Fifteenmile Stream, Forest Hill, Gold River, Goldenville, Harrigan Cove, Isaac Harbour, Kemptville, Killag, Lake Catcha, Lawrencetown, Leipsigate, Malaga, Montague, Moose River, Mooseland, Mount Uniacke, Oldham, Pleasant River Barrens, Renfrew, Salmon River, South Uniacke, Tangier, Upper Seal Harbour, Waverley, Whiteburn, Wine Harbour.

For copies of maps and plans application should be made to the Director, Geological Survey, Ottawa.

INDEX

PAGE
Acadia Exploration Co. 61
Acadia Gold Mining Co. 154
Acadia Gold Reduction Co. 157
Adams Company................ 132
Albion Company................ 125
Alexander mine................ 175
Alpha brook.................. 140
Alpha Gold Syndicate........... 109
American hill................. 203–206
Anderson mine................ 107
Annand mine.................49, 126–129
Annapolis co.................. 15, 30
Annis l...................... 38
Anticlines.................... 25, 45
Antigonish co................. 220
Antigonish Gold Mining Co....... 76
Antimony.................... 234–237
Archibald mine................ 92
Ardoise gold district............ 16, 56
Arlington Gold Mining Co........ 132
Armstrong hill................ 16
Ashdale gold district. *See* McKay Settlement
Atlantic Company.............. 80
Atlantic Mining Co............. 190
Avon r......................2, 30, 221
Bailey brook.................. 220
Barachois mine................ 211–214
Barachois r................... 226
Barrington bay................ 18
Barton mill................... 191, 192
Bear r....................... 33
Beaver Bank road.............. 217
Beaver Dam gold district........42, 57, 240
Beaver Hat Gold Mining Co...... 100, 101
Bendigo mine.................. 125
Bendigo Gold Mining Co......... 87
Beneficiary Gold Mining Co...... 131
Bibliography.................. 241
Big Five Mining Co............. 163
Big Mushamush l.............. 219
Birch cove.................... 217
Bismuth...................... 231
Black r...................... 23, 217
Black Hawk Mining Co.......... 112, 117
Blockhouse gold district......... 58, 240
Bluenose mine........51, 170, 171, 178–183
Bluenose Gold Mining Co.....126, 178–183
Bonanza mine................. 152
Boston and Goldenville Gold Mining Co....................... 130
Boston and Halifax Co.......... 84
Boston and Nova Scotia Co...... 203, 204
Boston and Oldham Co.......... 151
Boston Gold Mining Co.......... 119–121
Boston-Richardson Mining Co.... 197, 198
  Plant, photo..............Pl. XXXIII
Boston-Tangier Mining Co........ 192
Bower Mining Co............... 103
Bradford Mines, Ltd............ 93, 192
Bras d'Or l................... 16
Brazil lakes.................. 38
British Company............... 175, 176
British Gold Mining Co.......... 204
Broad r...................... 217
Brookfield gold district......25, 28, 48, 49, 59–61, 223, 240
Broom hill.................... 16
Brunswick Company............ 146
Burkner and Company.......... 203
Burlington Gold Mining Co...... 191
Bushing mine................. 63
Caledonia Company...........173–176, 212
Caledonia Mining Co............ 119–121
California Gold Mining Co....... 74
Cameron dam................. 217
Canada Company.............173, 174, 176
Cape Breton is............15, 41, 221, 226
Caribou gold district..24, 42, 49, 62–68, 240
Carleton gold district........... 68, 240
Cashon-Hines mine............. 115
Catcha l...................... 222
  See also Lake Catcha gold district.
Central Mining and Development Co. 71
Central Rawdon gold district..28, 48, 69–72, 222, 240
Centry....................... 217
Chebucto Mining Association...161, 202, 203
Chedabucto bay................ 30
Chegoggin.................... 38, 217
Chester basin................. 34
  See also Gold River gold district
Chester Basin Gold Syndicate.... 90
Cheticamp.................... 226–228
Chezzetcook.................. 217
  Gold. *See* Lake Catcha gold district
Chicago Company.............. 173, 174
Clam Harbour gold district....... 72, 220
Clark Gold Mines Corp.......... 127
Clearland..................... 217
Clyburn brook................. 228–230
Cobequid mountains............ 15
Cobourg Company............. 173–174
Cochrane Hill gold district..36, 42, 43, 54, 73
Colchester co..................15, 21, 220
  See also Gays River and Stewiacke gold districts
Coldstream Gold Mining Co...... 223, 225
Cole harbour.................. 217
Colonial Gold Mining Co......... 137, 161
Columbia Gold Mining Co........ 153
Concord Gold Mining Co......... 153
Consolidated Mines and Power Co. 182
Consolidated Mines of Canada, Ltd. 98, 138, 139
Copeland mine................. 76
Copes dam.................... 217
Copper l...................... 190, 222
Country Harbour gold district..27, 43, 54, 75, 101
Country Harbour r.............. 19, 36
Cowan mine................... 102
Cow Bay gold district.....28, 48, 51, 76, 240

PAGE
Coxcomb l. 140
Cranberry Head gold district 77
Cream Pot mine 77
Crescent Company 173
Crocker Mining Co 210
Crowneck point 37
Crows Nest mine 43, 54, 73–75
Cumberland co 15
Cumminger mine 173
Cunard cove 157
  Photo Pl. XXVII
Curry hill 219
Cushing mine 209
Dares l. 217
Darrs Hill gold district. *See* Salmon River gold district
Davidson brook 194
Delta Company 173, 174
DeWolfe and Company 203
Digby co 18, 35
Dixon mine 64–67
Dolliver Mountain mine 194–199
Dominion Antimony Co 236
  Plant, photo Pl. XL
Dominion Company 173–176
Dominion Mining Co 192
  Plant, photo Pl. XXXII
Donovan Mining Co 80
Dufferin mine 47, 51, 168–170
  Pls. XII, XV, XXIX
Duluth Gold Mining Co 115
Eagle l. 168
Eagle Mining Co 164, 169
East Rawdon gold district 50, 72, 78
Economy Mining and Milling Co 99
Ecum Secum gold district 42, 79, 240
  Photo Pl. V
Eel brook 92
Egerton Gold Mining Co 84
Egerton Syndicate 82
Eldorado Company 212
Elmsdale gold district 81
Empress Gold Mining Co 163, 164
English Company 213
Eureka Company 99, 213
Evangeline Gold Mining Co 77, 123
Fairview 217
Fall brook 223
Faribault brook 226
Farmville 217
Field of Gold Mining Co 158
Fifteenmile Brook gold district 81, 240
Fifteenmile Stream gold district 26, 42, 82, 240
Fletcher, Crossland, and Co 132
Folly mountain 220
Forest Hill gold district 42, 43, 54, 85, 101
Fourchu cape 38
French r 220
French Landing 217
Galena claim 227
Gallagher Gold Mining Co 97, 98
G. and K. Gold Mining Co 138, 139
Gays River gold district 3, 223–225, 240
Gegogan 218
Gilmore mine 117
Gilt Edge Gold Mining Co 220
Gladstone Company 177
Gladwin Mining Co 57

PAGE
Glen brook 234
Glenelg Company 212
Globe Company 213
Gold brook 230
Gold districts, detailed descriptions 56–216, 223
Gold production 238–240
Gold prospects 216–220
Gold Eagle Mining Co 123
Golden Group Mining Co 127
Golden Lode Mining Co., Ltd 186
Golden Stair, the 100
Goldenville gold district. *See* Sherbrooke gold district
Goldenville Gold Mining Co 182
Goldfinch Mining Co 99
Gold Lake gold district 42, 87
Gold River gold district 47, 87–91, 222, 240
Gold Zone Mining Co 79
"Grand Banks" 16
Grandin Brook deposit 227
Grape Vine Company 173
Great Belt Mining Co 147
Great Bras d'Or Gold Mining Co 232
  Plant, photo Pl. XXXIX
Greenfield 218
Greenvale 220
Griffin, S. R. and Son 99
Grum point 187
Guffey-Jennings Gold Mining Co 65
  Plant, photo Pl. XVII
Gull l. 18
Guysborough co 35, 36, 217, 219
  See also following gold districts:
    Cochrane Hill
    Country Harbour
    Forest Hill
    Isaac Harbour
    L. Seal Harbour
    Miller l.
    Sherbrooke
    U. Seal Harbour
    Wine Harbour
Guysborough Gold Mining Co 214
Halifax 218
Halifax co 20, 21, 218
  See also following gold districts:
    Beaver Dam
    Caribou
    Clam Harbour
    Cow Bay
    Ecum Secum
    Elmsdale
    Fifteenmile Stream
    Gold Lake
    Harrigan Cove
    Killag
    Lake Catcha
    Lawrencetown
    Montague
    Moosehead
    Mooseland
    Moose River
    Oldham
    Salmon River
    Tangier
    Waverley
Halifax harbour 34, 220

Page

Hall-Anderson Gold Mining Co.... 84
Hamilton Company.... 175
Hammond Plains.... 43, 218
Hanright mine.... 107–109
Hants co.
  Antimony.... 234
  Gold. *See* Ardoise
    C. Rawdon
    E. Rawdon
    McKay
    Mt. Uniacke
    Pleasant River
    Renfrew and
    S. Uniacke gold districts
Harrigan Cove gold district..25, 42, 91–94, 240
Hartford Gold Mining Co.... 161–163
Hemlock fall.... 88
Hilchey Mining Co.... 67
Home Gold and Copper Co.... 117
Hopewell Mining Co.... 76
Horne Settlement.... 218
Hubley l.... 41
Humber Gold Mining Co.... 132
Hurricane Point mine.... 95–100
Hyde mine.... 63
Imperial Company.... 145
Indian harbour.... 27
Indian l.... 218
Indian Path mine.... 94
Inverness co.... 226, 232
Inverness Mining Co.... 228
Iron Cap claim.... 228
Irvin l.... 220
Isaac Harbour, photo.... Pl. XX
Isaac Harbour gold district..25, 42, 50, 51, 95–101, 222
Island Mining Co.... 98
Johnson brook.... 75
Kearney l.... 218
Kemptville gold district.... 102, 240
Kent Gold Quartz Co.... 192
Kentville.... 33
Ketch harbour.... 41
Keyes brook.... 81
Killag gold district....26, 42, 103, 240
King Fissure Gold Mines, Ltd.... 61
Kings co....23, 26–30, 33, 217, 219
Kingston and Sherbrooke Co.... 173, 174
L'Abime brook.... 226–228
Lahave r.... 34
Laidlaw hill, notes and photo.... 202–206
Lake Catcha gold district..25, 42, 105–109, 240
Lake Lode Co.... 64
Lake Major Co.... 203
Lake View mine....200, 205–208
Lawrencetown gold district....42, 110, 240
Leckie, R. G., and Co.... 125
Leipsigate gold district..28, 43, 48, 112–118, 240
Lewis l.... 218
Libby vein. *See* Brookfield gold district
Lincoln Gold Mining Co.... 89
Lindsay l.... 218
Liscomb Falls Gold Mining Co.... 123

Page

Liscomb Mills.... 218
Little Ditton, Que.... 33
Little Klondike mine.... 104
Little Liscomb l.... 218
Little Meander r.... 122, 222
Liverpool Company.... 200
Lochaber.... 118
Loon Brook Gold Mining Co.... 127
Lowe mine.... 81
Lower Seal Harbour gold district 43, 54, 96, 99–102
Lunenburg bay.... 156
Lunenburg co....26, 41, 217

  See also following gold districts:

    Blockhouse
    Gold River
    Indian Path
    Leipsigate
    Ovens
    Voglers Cove

Lunenburg harbour.... 26
McConnell Gold Mining Co.... 86
McCulloch and Co.... 157
McDonald, A., and Co.... 152
McGee l.... 16
McKay Settlement gold district.. 122, 240
McLellan brook.... 220
McMann mine.... 92
McNab and Company.... 145
McNutt is.... 37
McQuarrie mine.... 125
Magdalen is.... 16
Mahone bay.... 18, 34
Maitland settlement.... 18
Major l.... 124
Malaga gold district....118–122, 240
Maple Leaf Gold Mining Co.... 169
Margaree r.... 222
Maritime Gold Mines, Ltd.... 138
Martin r.... 217
Meagher Grant.... 218
Meander River gold district. *See* McKay Settlement
Menamkeak stream.... 113
Meridian Company.... 173–175
Metals Mining and Smelting Corp. 128, 198
Metropolitan Company.... 173
Mexican Mining Co.... 179, 182
Micmac mine.... 113–117
  Plant, photo....Pl. XXI
Middle r....222, 230, 240
Miller Lake gold district.... 123, 240
Miller Mining and Milling Co.... 169
Millipsigate Gold Mining Co.... 115
Mill Village gold district.... 123, 240
Minneapolis and Molega Co.... 119
Modstock Gold Mining Co.... 86
  Mine, photo....Pl. XIX
Molega gold district. *See* Malaga gold district
Montague gold district....25, 42, 47, 49, 124–129, 240
Montreal Exploration Co.... 125
Montreal-London Gold and Silver Dev. Co.... 169
Montreal Mining Co....136, 137, 141–148

PAGE
Moose l........................ 54
Moosehead gold district.......... 130, 240
Mooseland gold district......27, 42–45, 54, 130–132
Moose River gold district...... 21, 24, 29, 41–44, 54, 68, 132–140, 222
  Photos..............Pls. VI, VIII, XI
Mountain Top claim............. 228
Mount Uniacke gold district..22, 25, 29, 42, 45, 50, 140–149
  Photos..............Pls. VII, X, XIV
Muddy pond..................200, 202, 207
Mulgrave mine.................. 97
Mullach brook.................. 233
Murdock brook.................. 234
Mushamush r.................... 217
Musquodoboit harbour........... 41
Musquodoboit r................. 30
Napier Mining Company......153, 213, 214
National Mining Co............. 147
Neptune Gold Mining Association. 89
New Albion Gold Mining Co...... 126
New Cornwall, Upper............ 219
New Egerton Gold Mining Co..... 84
  Plant, photo................Pl. XVIII
New Eldorado Co................ 214
New England Mining Co......... 153, 198
New Glasgow Gold Mining Co..... 178
  Plant, photo................Pl. XXXI
New Harbour r.................. 27
New Haven Co................... 162
New Ross....................... 41
New York and Nova Scotia Gold Mining Co.................. 190
New York and Renfrew Co........ 162
New York and Sherbrooke Co..173–175, 177
Ninemile r.................... 159, 222
North American Co.............. 204
North Brookfield Mining Co..... 60
North Mining Co................ 163
North Star mine...............95, 98, 99
Northup Mining Co.............. 71
Northwest Branch brook......... 95
Novamac Mines and Power Corp.. 74, 182
Nova Scotia and Mexican Mining Co. 179
Nova Scotia Gold Mining Co..... 202, 225
Nova Scotia Mines Syndicate, Ltd. 127
Number-eight brook............. 160
Oakdale Company................ 90
O'Brien, M. J.........104, 138, 139, 154, 164
O'Brien l...................... 219
Officer brook.................. 217
Oldham gold district...42, 45, 48, 49, 150–156, 240
  Photos...................... Pl. IX
Oldham Sterling Gold Co........ 154
Old Provincial Mining Co.....104, 121, 215
Ophir Gold Mining Co........... 60, 162
Orient Company................ 212, 213
Ovens gold district........31, 44, 156, 157, 222, 240
  Photos........Pls. IV, XXVII, XXVIII
Owen Gold Mining Co............ 115
Oxford Gold Mining Co.......106–108, 222
Pactolus Gold Mining Co........ 177
Palgrave Gold Mining Co........ 98, 205
Palmerston Company..........173–176, 178
Parker-Douglas mine..........119–121, 209

PAGE
Partridge r.................... 110
P. C. F. property............140–142, 148
  Open-cut, photo.............. Pl. VII
Pennant harbour................ 41
Petite Mare brook.............. 105
Petpeswick Mining Co........... 108, 109
Philadelphia Mining Co......... 59
Phoenix Land and Development Co. 147
Phoenix Mining Co.............. 87, 213
Pictou Development Co.......... 160–164
Pioneer mine, Caribou district.... 63
Pioneer Mining Corp., Ltd...... 84
Pittsburg Gold Mining Co....... 80, 191
Platinum. 231
Pleasant River Barrens gold district. 157–159, 240
Plough Lead Gold Mining Co..... 214
Ponhook l...................... 119, 121
Porcupine cape................. 220
Porcupine North Star Gold Mines, Ltd. 121
Porter l....................... 219
Port Joli harbour.............. 36
Port Latour harbour............ 36
Port Mouton.................... 18
Powdermill l................... 200
Prince Lodge................... 217
Provincial Company............. 213
Pubnico. 36, 37, 219
Queen Company.................. 145
Queens co..................26, 34, 35, 217

See also following gold districts:

Brookfield
Fifteenmile Brook
Malaga
Mill Village
Whiteburn

Queens County Mining Co........ 209
Queensport. 219
Quoddy. 219
Ragged falls................... 219
Ramsay l....................... 41
Rawdon hills................... 23, 69
Rawdon United Mining Co........ 79
Renfrew gold district..42, 45, 159–166, 240
Reynolds Bros. Gold Mining Co... 137
Rhodes Corner.................. 219
Richardson Gold Mining Co...... 196
  Vein, photo..................Pl. XIII
Richfield Mining Co............ 228
River l........................ 27
Riversdale. 220
Rochester mine................. 175
Rockland Mining Co............. 98, 203
Rockville Company.............. 174–176
Rocky l........................ 217
Rose bay....................... 157
Rose Gold Mining Co............ 126
Roseway r...................... 34
Rossignol Mining Co............ 209
Royal Mining Co................ 147
Royal Oak Mining Co............ 178, 179
Rude hill...................... 210
Rutherford mill................ 219
Sable is....................... 3
St. Andrew's Company........... 151

PAGE

St. Anthony Gold Mining Co. 93
St. Helen's Smelting Co. 236
St. Margaret bay 34
St. Mary r.
  Rocks 22, 31
  Valley, photo Pl. II
Salisbury Gold Mining Co. 127
Salmon River gold district 42, 47, 51, 166–170, 240
  See also Dufferin mine
Salmon River Big l. 27
Sambro 41
Satemo Gold Quartz Co. 191
Scotia Mining and Development Co. 117
Scraggy l. *See* Gold Lake gold district
Seal Harbour Mining Co. 101
Seventeenmile stream 217
Shanghai Gold Mining Co. 111
Shears cove 27
Shears Point gold district. *See* Moosehead gold district
Sheet harbour 27
Sheet Harbour r. 19, 219
Shelburne co. 18, 34, 35
Sherbrooke (Goldenville) gold district 42, 50, 51, 170–184, 240
Sherbrooke Mines and Power Co. 182
Sherlock l. 63
Shubenacadie r., valley 30
Silver 43, 231
Silver Cliff deposit 228
Simeon Ernst mine 158
Sissiboo r. 29
Skunk Den mine 99
Sleepy cove 220
Somerset 219
Sophia Mining Co. 205
South mountain 16
Southeast Passage 22
South Uniacke gold district 49, 50, 149, 185–187
Spondo 219
Springfield Gold Mining Co. 178
Standard Gold Co. 153
Stanford Company 203
Stanley Gold Mining Co. 84, 174
Statistics 238
Stellarton Gold Mining Co. 178
Sterling Company 151
Stewart brook 219
Stewiacke, gold 42, 184
Stillwater 219
Stinking l. 159
Stormont, gold production 101, 240
Stormont Gold Mining Co. 99
Strathcona Mining Co. 87
Strawberry Hill Co. 191
Stuart-Hardman mine 178
Sutherland r. 220
Sutherland Development Co. 178
Sweet, E. S., and Co. 87, 99
Sydney Gold Mining Co. 76
Symonds-Kaye mine 126, 127
Tancock is. 219
Tangier gold district 3, 25, 34, 41–44, 47, 187–194, 222, 240
Tangier r. 131

PAGE

Tatamagouche mountain 220
Taylor Gold Co. 203, 204
Tenmile l. 27
Thomas l. 200, 202
  Photo Pl. III
Thompson and Quirk mine 186
Threemile l. 200
Tommy Burns Gold Mines, Ltd. 61
Torrance bay 41
Touquoy Gold Mining Co. 136–139, 146, 222
Townsend and Company 110
Truro Gold Mines Co. 64
Try Again mine 175, 176
Tudor Gold Mining Co. 205, 206
Tunnel Mining Co. 205
Tupper l. 33
Uniacke Gold Mining Co. 146
Uniacke Mines and Power Co. 90
Union Company 125
Union Development Co. 178
United Mining Association 98
Upper Newport gold district. *See* McKay Settlement
Upper Seal Harbour gold district 25, 101, 194–199
Victoria co. 226, 228
Victoria mine 96, 97
Victoria Gold Mining Co. 58, 187
Victory Gold Mines, Ltd. 99, 101
Voglers Cove mine 199
Wadlow and Company 110
Wagamatkook 230, 240
Warwick Gold Mining Co. 164
Waterville 219
Waverley gold district 22, 41–47, 200–208, 240
  Photo Pl. I
Waverley and Boston Co. 203
Wellington Company 173–178
Wentworth Company 173, 174, 178
Werner and Company 224
West Annan 220
West Caledonia 220, 240
Westfield 208
West Gore 28, 41–44, 234
West Lake mine 49
West Lake Co. 145
Westminster Gold Mining Co. 80, 111
West River Sheet Harbour 27
Wharton and Company 120
Whidden, E., and Co. 153
Whiteburn gold district 208–210, 240
Whitehaven 37
Whycocomagh 232
William l. 200
Wilson mine 158
Windsor Junction Gold Mining Co. 205
Wine Harbour gold district 210–216, 222, 240
Withrow Mining Co. 186
Wolfville Company 202
Woodbine Company 173, 174
Worcester-Tangier Gold Mining Co. 192
Wyses Corner 220
Yarmouth co. 35, 36
  See also Carleton, Cranberry Head, and Kemptville gold districts
York Redoubt 220